MAY 25, 1944

American Machinist

TECHNOLOGY DEPT.

Tooling Dock Speeds Fixture Making

•

Magnesium Sheet Easily Formed

•

Fewer Teeth for Milling Cutters

•

Gages Inspected for Lend-Lease

•

Are You Ready for "T" Day?

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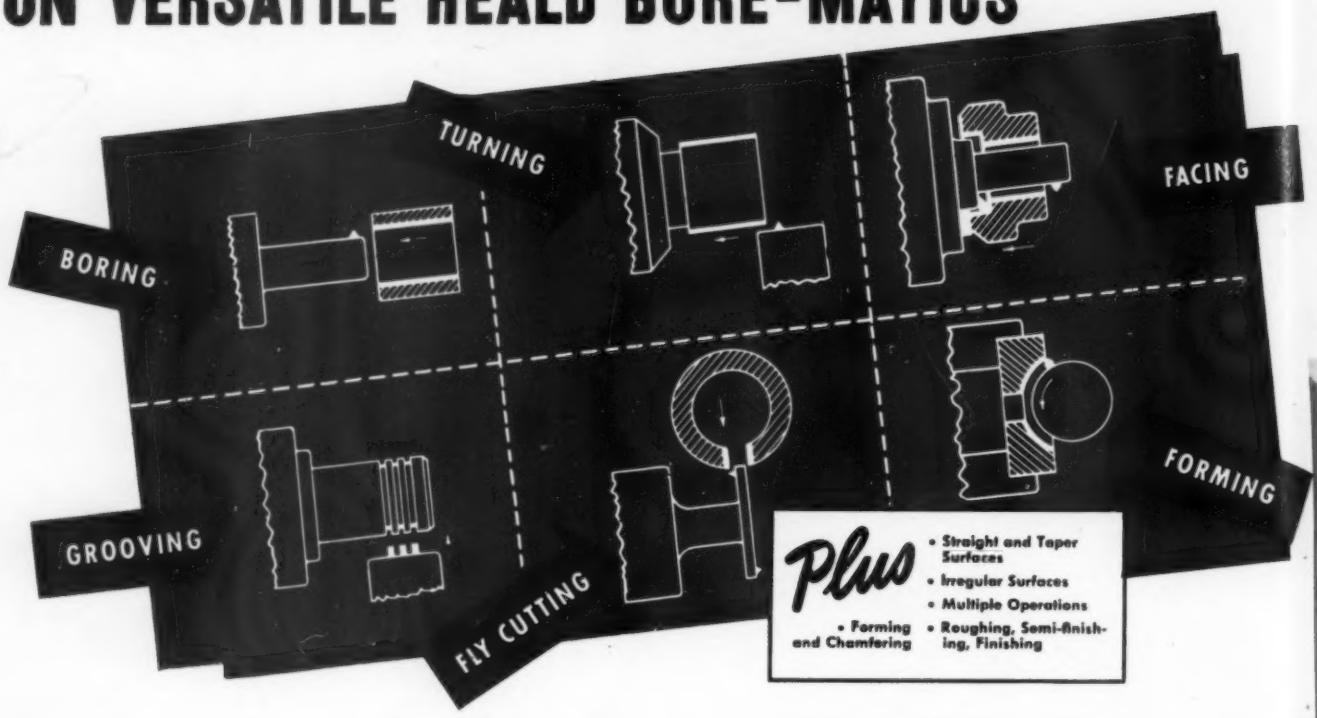
Do all these Precision Jobs
ON VERSATILE HEALD BORE-MATICS

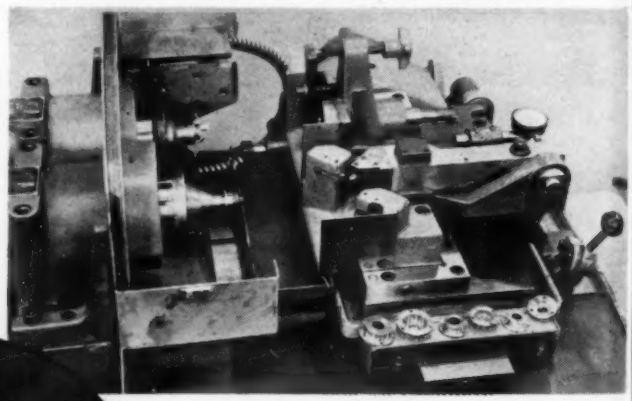


V. F. 1* *ALL-PURPOSE* VERSATILITY *FOR ALL APPLICATIONS*

Here's a way to hold size, roundness, straightness to tenths . . . get perfect squareness, concentricity, alignment . . . produce better finish, reduce or even eliminate final lapping and honing . . . boost production, lower costs . . . *this way*—Borize on *Bore-Matics.*

Such results are not limited to just one type of operation. Heald Bore-Matics are all-purpose tools—for all kinds of jobs, for all types of operations. Unusual flexibility gives them unusual *versatility*, makes it possible to execute boring, turning, facing, chamfering, grooving with equal efficiency. Either straight or taper surfaces can be machined, and also curved and irregularly-shaped surfaces. These operations can be accomplished singly, simultaneously, progressively or in combination. Nor are operations restricted to final finishing—roughing and semi-finishing can be done, too.

Heald Bore-Matics can help you meet postwar competition, aid in creating new postwar markets—thru more precision, more production on all vital operations. Get the Bore-Matic story, now . . . The Heald Machine Company, Worcester 6, Massachusetts.



Borizing Gun Housings. Six operations—turn, face, chamfer, bore. Two stations. Single end operation. Rotary and stationary fixtures. Compound feed, table and cross-slide. Automatic cycle. Such versatility in Bore-Matic design permits ready adaptability to the exact requirements of every job.

V. F. 1—Application
V. F. 2—Function
V. F. 3—Tooling
V. F. 4—Fixtures

HEALD *Bore-matics*

THE MOST VERSATILE MACHINE TOOL

MAY 25 1944

Incorrect paging noted:

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Check same in yearly index.

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From _____

_____

To _____

_____

Signed _____

American Machinist Chips

Aircraft Giant . . . We knew Chrysler's Dodge Chicago plant was quite a place . . . but we didn't until now quite grasp the size of the main building, the machining-assembly unit, covering 82 acres of land. *Willow Run could be set down in it with enough room left to lay out 20 baseball diamonds.* (Plus, we guess, Babe Ruth.) The magnesium foundry, when operating at capacity, is designed to pour a million lbs. of magnesium a month—by far the largest amount ever poured in one magnesium foundry. Put that on your miller and turn it.

Incidentally, Chrysler's Amplex Division has developed 14,000 different types of powder metal parts for war use.

Irons Again . . . You may have seen that WPB has restored the production goal of 2,000,000 electric flat irons . . . which two weeks previously had been cut to 200,000. This is positively the last time *Chips* will comment on the flat iron situation. It is too hard to keep up with.

Perpetual Motion . . . The Aluminum Company's always interesting *News Letter* tells us of an aluminum "hatch handle", bearing the name "Alcoa" and a lot number, which was found on a late model Messerschmitt shot down over Tunisia. The identification enabled government officials to establish beyond doubt that it had been salvaged by the Germans from an Allied plane shot down over enemy territory. The number was traced and the handle found to be one of a batch of aluminum sand castings manufactured for Glenn L. Martin.

If the handle gets put on another American plane, we hope that this time it can stay put.

Leave Us Have Light . . . In the previous issue (May 11) appeared the third in our new series of "Metal-Working Tomorrow" articles which attempt to forecast shop conditions for the next 5 years . . . based on recent developments in leading plants.

Article No. 3, "What's Ahead in Lighting", told how good overhead lighting will be supplemented by scientific application of light to machines and work—thus bringing lighting more than ever within the province of the production executive. Reprints of this article, as with its predecessors on heat-treating and finishing, are available for a thin dime each.

Inventions . . . Winding up our reporting of the 19 basic U. S. inventions as described by the *Allis-Chalmers Electrical Review*, we give you Edison's incandescent lamp, phonograph and motion picture projector; Hall's reduction of aluminum; Tesla's induction motor; Baekeland's Bakelite.

Today's Cheerful Thought . . . We quote from the *American Mutual Magazine*: "Accident investigation in munitions plants frequently is complicated by the fact that most evidence and witnesses are destroyed."

Hendy Iron Men . . . Joshua Hendy Iron Works reports with pride the completion of its newest product—a Diesel engine of advanced and original design. Welded-steel construction, overhead camshaft and oil-cooled pistons are among the many new features. The new models are suitable for both stationary and marine installations.

LIFE'S DARKEST MOMENT

Courtesy Mr. Webster and the New York Herald Tribune

ALL 4 WHEELS DRIVEN BY SPIRAL BEVEL GEARS

Military trucks . . . with all four wheels driven by Gleason-cut spiral bevel gears . . . are helping to make the cry, "too little, too late," a thing of the past.

Power drive on front as well as rear wheels gives these vehicles the traction to overcome the obstructions of deep mud, steep grades, and rough, shell-torn ground . . . the ability to move men and supplies cross-country directly to the battle front.

In handling the load extremes encountered in this type of transport, the driving gears must take terrific punishment. Because they possess the required accuracy, load capacity, and toughness, Gleason-cut spiral bevels are universally used for the final right-angle drive in these applications.

Today, Gleason machines are engaged in precision manufacture of spiral bevel gears for military trucks and other materiel of war. To-morrow they will be available to bring improved performance to the products of a world at peace.

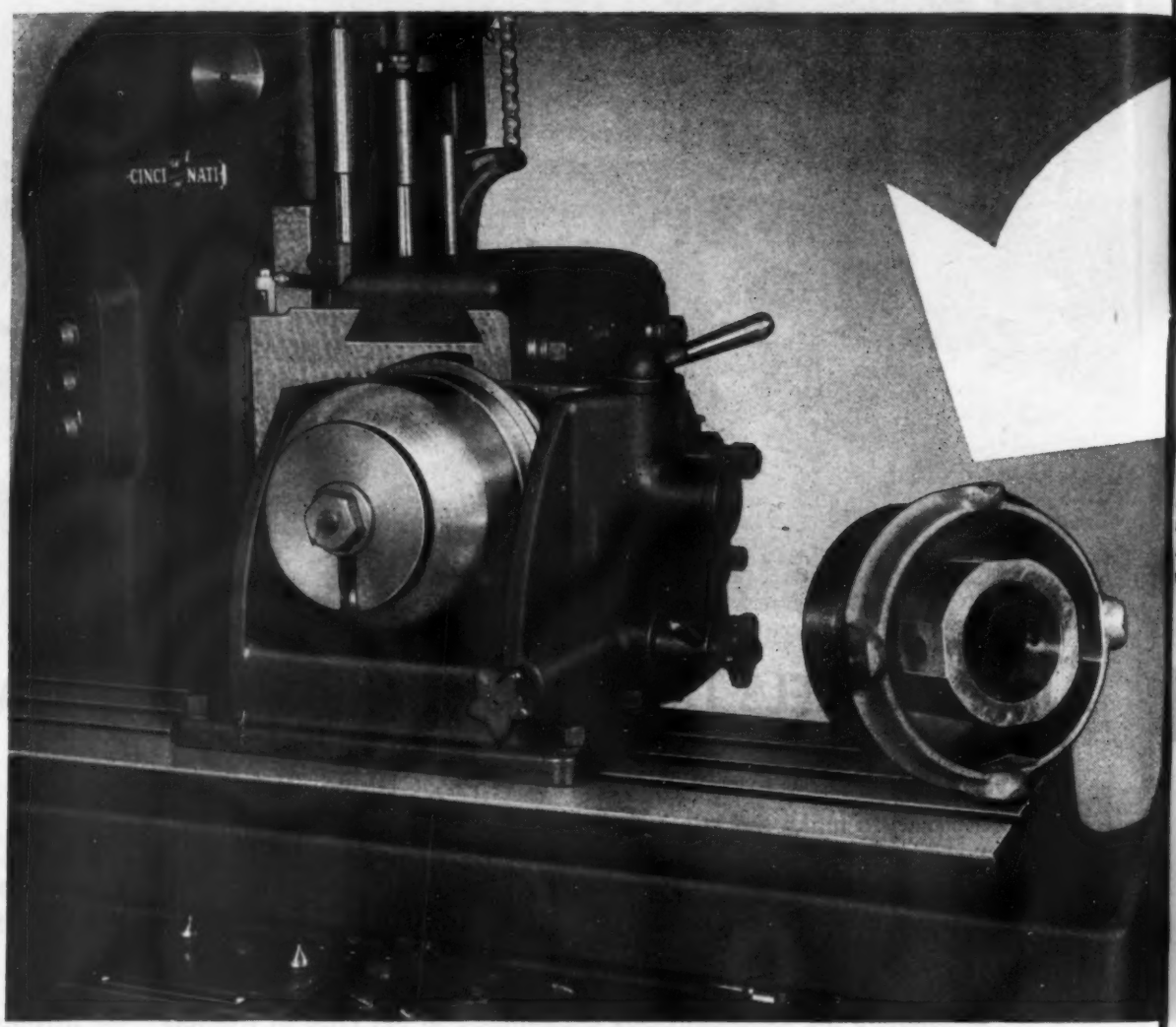
GLEASON

GLEASON WORKS

Builders of Bevel Gear Machinery for Over Seventy-five Years

1000 UNIVERSITY AVENUE, ROCHESTER 3, N. Y., U. S. A.

An inside job



Arrow points to a close-up of the milled part. Notice the eight flats—four on the hub and four on the inside of the rim. The machine is a CINCINNATI *No. 2-24 Automatic Rise and Fall Milling Machine. For complete specifications, write for catalog M-909-1. Sweet's Catalog File for Mechanical Industries gives a brief description.*

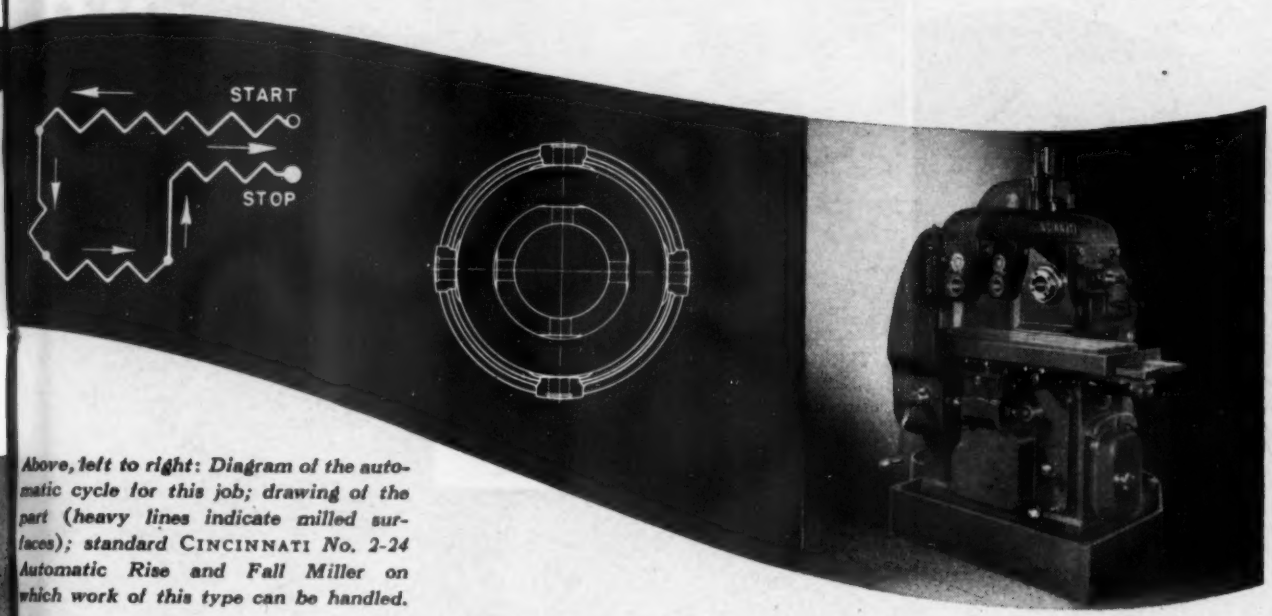
CINCINNATI

Keep on buying WAR BONDS

THE CINCINNATI MI

MILLING MACHIN

AUTOMATICALLY MILLING TWO OPPOSITE FLATS

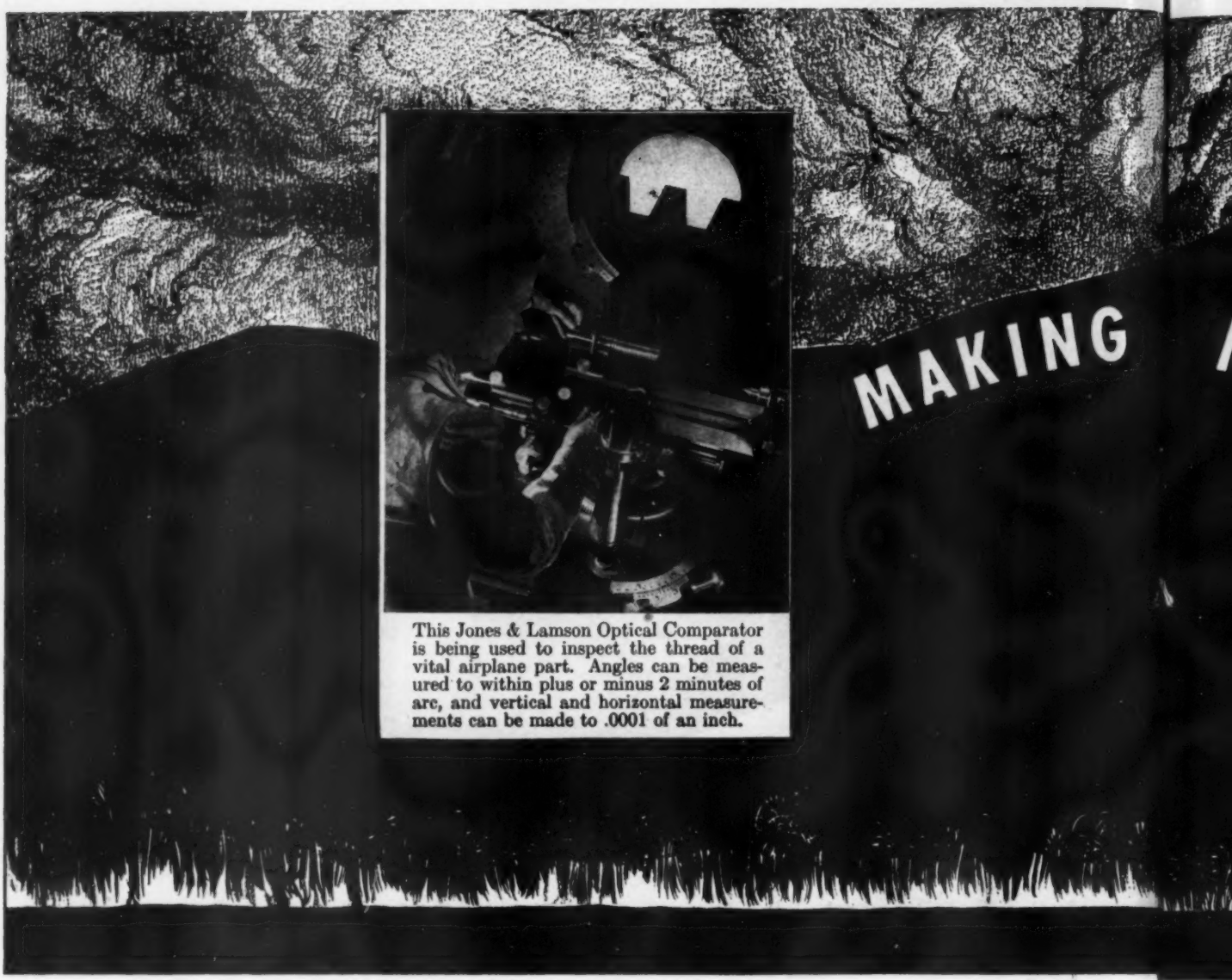


Above, left to right: Diagram of the automatic cycle for this job; drawing of the part (heavy lines indicate milled surfaces); standard CINCINNATI *No. 2-24 Automatic Rise and Fall Miller on which work of this type can be handled.*

In the illustration at the left, a CINCINNATI No. 2-24 Automatic Rise and Fall Miller is milling two opposite flats in four positions on an aluminum piston for an aircraft propeller. Four of the flats are on the inside diameter of the rim, while the four opposing flats are on the outside diameter of the hub. Each pair of flats is automatically milled in one cycle. The flat on the hub is milled first. The spindle carrier rapid traverses down and feeds the cutter to depth on the rim, then follows the milling cut for the flat on the rim. The spindle carrier rapidly returns to the top of the stroke and the table traverses slightly to the left so the cutter clears the hub. ¶ The fixture which holds the part is arranged with four-position hand indexing, with the index holes located in the work itself. The entire setup solved a very difficult milling operation within the narrow space between the hub and the rim of the part. ¶ Whatever your milling problems, irrespective of their complexity, it will be to your advantage to consult the engineers here at Milling Headquarters.

MILLING MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES

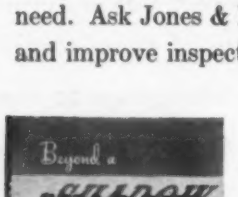


This Jones & Lamson Optical Comparator is being used to inspect the thread of a vital airplane part. Angles can be measured to within plus or minus 2 minutes of arc, and vertical and horizontal measurements can be made to .0001 of an inch.

There are people who *must* make mountains out of molehills. They are those who must detect and measure the microscopic irregularities that would, if undiscovered, swell scrap heaps, retard production and even endanger lives.

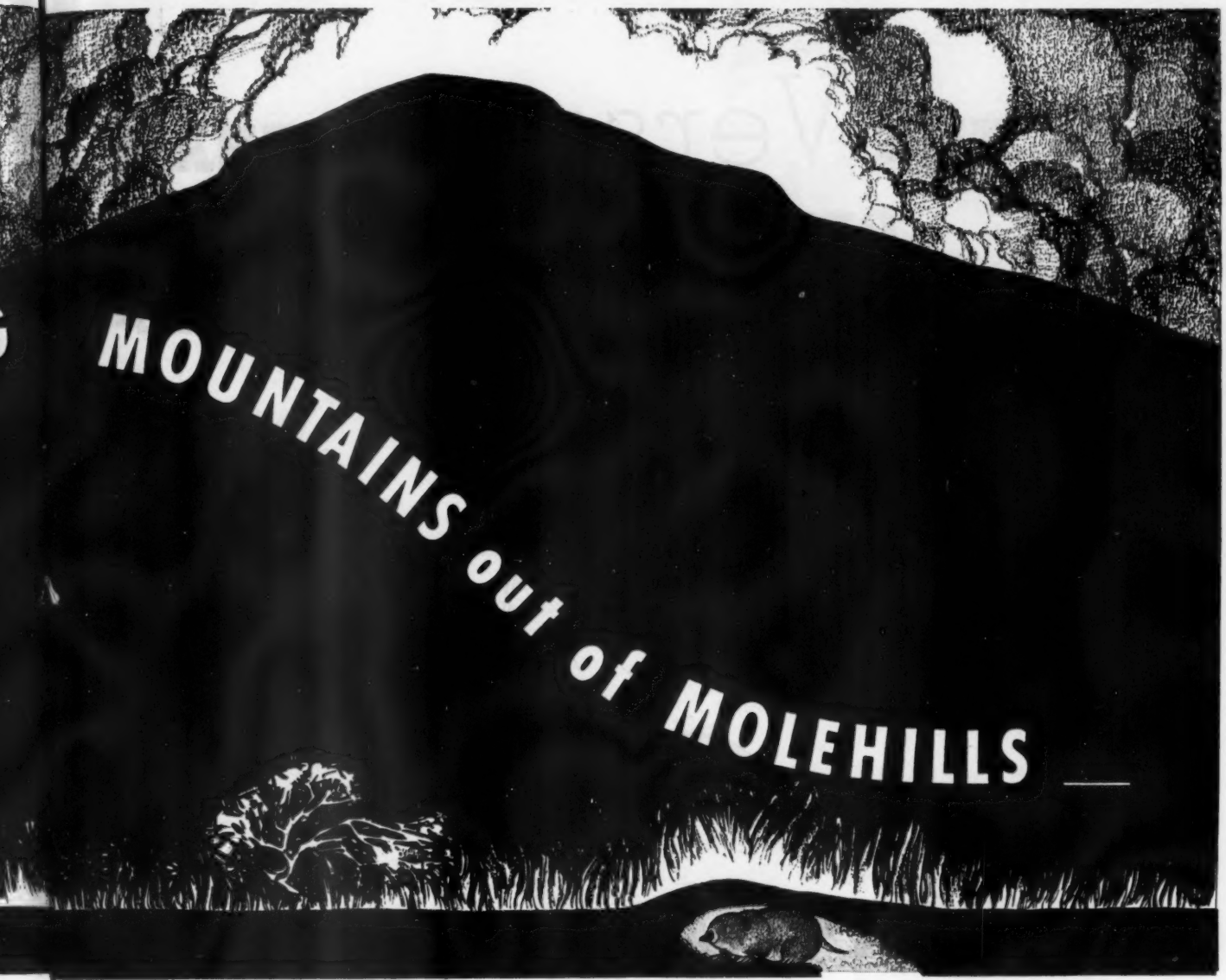
Jones & Lamson Optical Comparators enlarge minute imperfections to conspicuous size. By the use of the Comparator, inspectors of tools and products can *see* and *measure*, accurately and quickly, faults that might elude other means of inspection.

Jones & Lamson Optical Comparators are made in various models to meet every need. Ask Jones & Lamson inspection engineers how you can use them to expedite and improve inspection in your plant. Ask them today!



This book, "Beyond a Shadow of a Doubt" will tell you more about our Optical Comparators and what they are doing.

When purchasing equipment for measurement and inspection by optical projection, you should demand: 1. Precision Condensing Lens System for controlling light. 2. Projection lenses that project a sharply defined image, free from distortion and color, *anywhere on the screen*. 3. Optically Flat Reflection Mirrors *sufficiently thick* to insure *permanent* flatness. 4. Provision for positively aligning the illuminating system, staging fixtures, projection lens, mirror and screen in correct relation to each other. 5. Rigid Machine Construction.



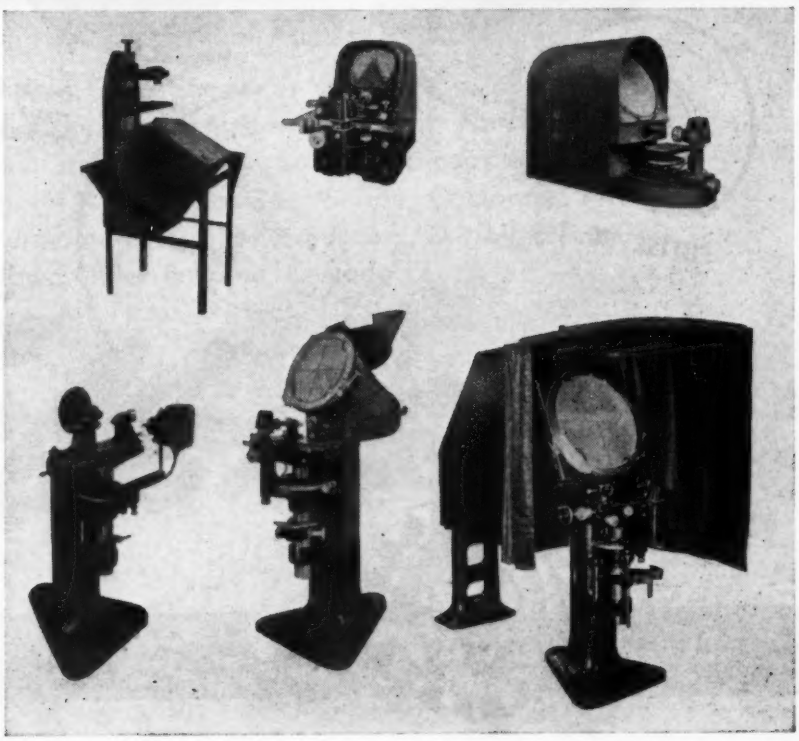
JONES & LAMSON

MACHINE COMPANY

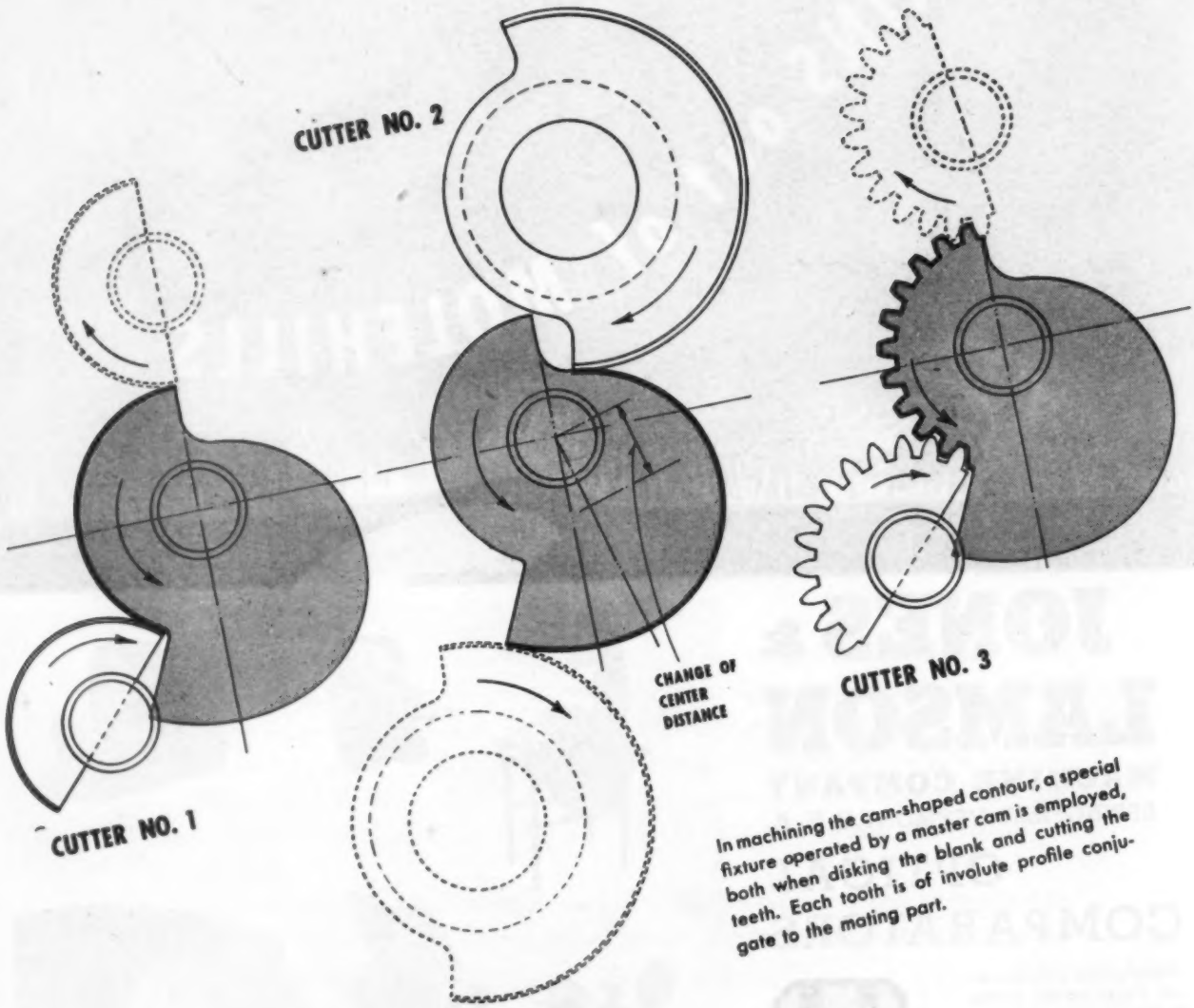
SPRINGFIELD, VERMONT, U. S. A.

OPTICAL COMPARATORS

Manufacturers of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.



THE Versatile GEAR OFTEN SAVES CREATING A SPECIAL-



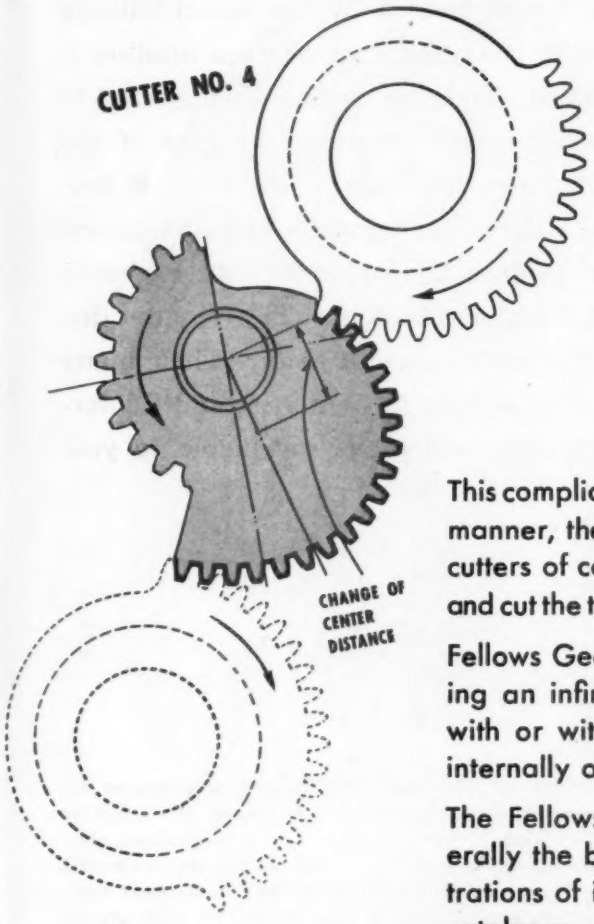
In machining the cam-shaped contour, a special fixture operated by a master cam is employed, both when disking the blank and cutting the teeth. Each tooth is of involute profile conjugate to the mating part.

THE FELLOWS METHOD...MACHINES AND TOOLS FOR

SHAPER

PURPOSE MACHINE

In producing this special segment-gear part, the Fellows Gear Shaper disks the concentric and cam-shaped surfaces of the blank—then generates the teeth on both the concentric and cam-shaped gear segments—simply, and accurately on a standard machine.



This complicated segment-type gear illustrates in a dramatic manner, the versatility of the Gear Shaper Method. Four cutters of comparatively simple design machine the blank and cut the teeth on the concentric and cam-shaped surfaces.

Fellows Gear Shaper Cutters can be designed for producing an infinite variety of regular or irregular contours—with or without teeth; and the work may be machined internally or externally and into a recess.

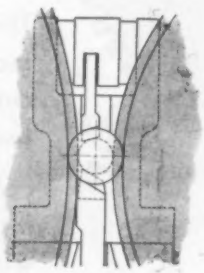
The Fellows Gear Shaper is so versatile that it is generally the busiest machine in any plant. For further illustrations of its broad scope, write for a copy of our latest catalogue. The Fellows Gear Shaper Company, Springfield, Vermont—or 616 Fisher Building, Detroit 2—or 1040 West Town Office Building, Chicago 12.

Fellows

ALL OPERATIONS FROM BLANK TO FINISHED GEAR

DID YOU KNOW YOU CAN GRIND "OUT-OF-BALANCE

To handle out-of-balance work on a CINCINNATI Centerless Grinder, a special infeed arrangement and an overhead pressure shoe which carries an angle edge insert are co-ordinated to establish rotation of the part before the grinding cut starts. ¶ As the infeed lever moves the work into position, the overhead pressure shoe moves down so that the angular edge of the insert contacts the work. (See sketch.) The pressure against the angular edge of the work rest blade holds the part against the regulating wheel. These elements exert the right amount of pressure to counteract the forces created by the out-of-balance work, with the result that uniform rotation is maintained. Thus the work will be ground to accurate limits of roundness in spite of the out-of-balance condition of the part. ¶ Setups for Centerless grinding out-of-balance work is another development of the engineers here at Grinding Headquarters. Why not discuss your problems with them? Their many years of experience in Centerless and Center-type grinding will prove invaluable to you.



Above: Sketch of hold-down pressure shoe arrangement for Centerless grinding out-of-balance work. Right: The setup for grinding two different size diameters of an out-of-balance part. Heavy colored lines adjacent to the part indicate the two ground diameters. The machine is a CINCINNATI No. 2 Centerless Grinder equipped with profile truing attachments for both wheels.

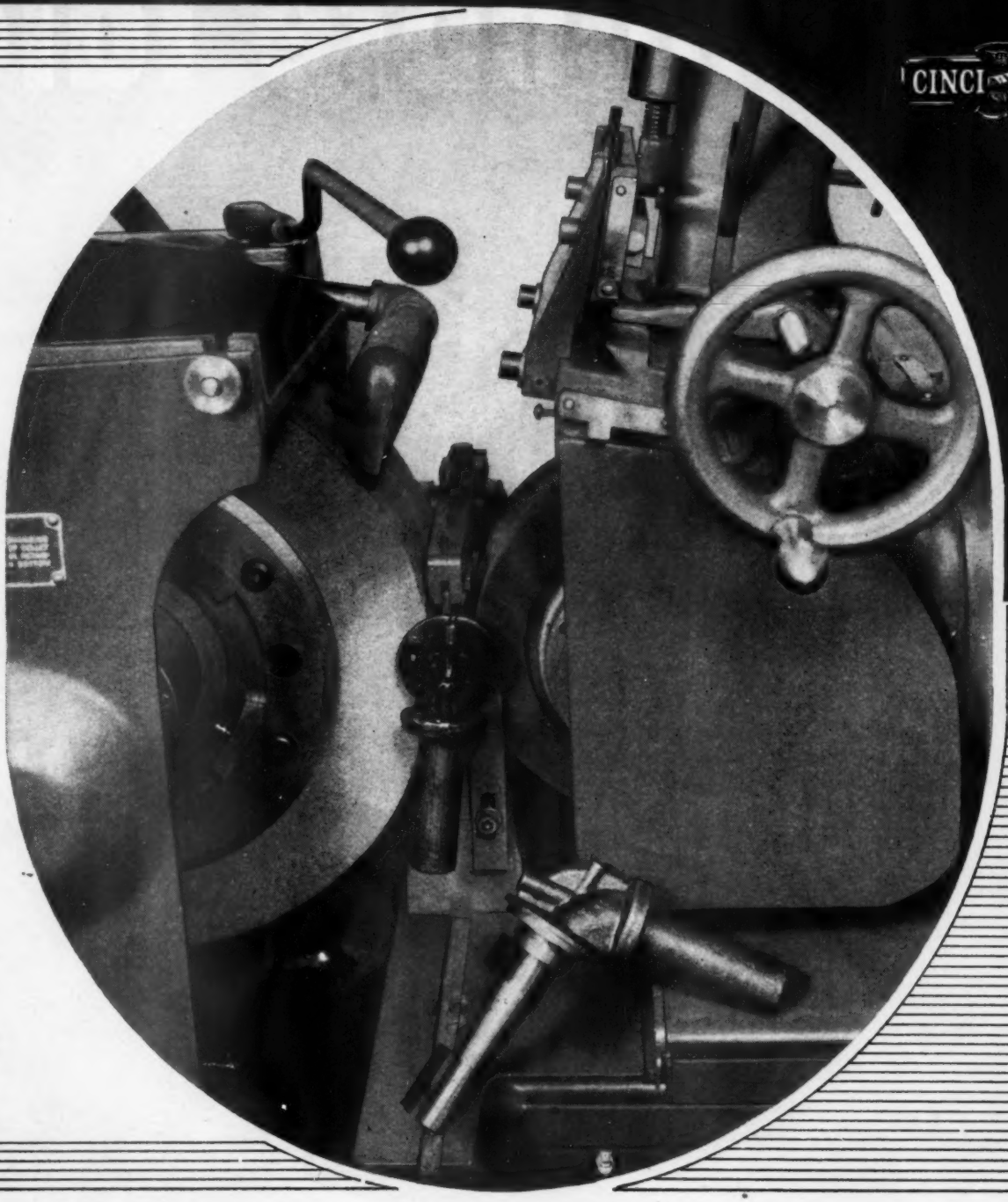
At the left is shown the CINCINNATI *No. 2 Centerless. Catalog G-456-1 gives complete specifications. Sweet's Catalog File gives a brief description of all* CINCINNATI *Machines.*

Keep on buying WAR BONDS

CINCINNATI

CENTER TYPE GRINDING MACHINES

WORK" on a Cincinnati Centerless?



GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

Eliminate Idle

SPECIFICATIONS—No. 22L Plain and Universal. Table: 45"x10". Range: 28" longitudinal; 10" cross; 16" vertical

Machine Time

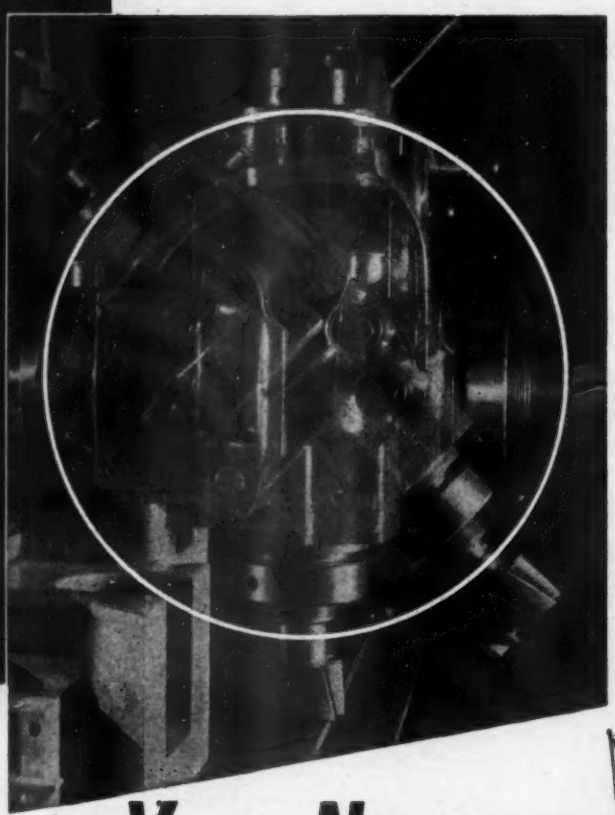
CAUSED BY WORK RESET-UPS

★ ★ ★ ★ ★

WITH VAN NORMAN RAM-TYPE UNIVERSAL MILLERS

Repeated set-ups of a work-piece through successive milling operations result in production loss because the machine is idle and non-productive while the operator makes the reset-up. Added up, this idle time often exceeds the machines productive time.

You can minimize idle machine time and increase production with a Van Norman Ram-type Universal Miller . . . the milling machine that gives you horizontal, angular, or vertical milling without changing the set-up or moving the work to another machine. Not only does this enable you to complete most jobs with the original set-up, but it also eliminates errors and subsequent work spoilage that very often results with continuous reset-ups.



Adjustable Cutterhead Mills at any Angle

The Van Norman Swiveling cutterhead, mounted on a sliding ram, is quickly and easily moved to any desired cutting position between horizontal and vertical. Three heavy clamping bolts hold the cutterhead rigidly in position for precision milling. Hardened stops, accurately set at the factory, are provided for 0° and 90° positions of the head. Angular positions are indicated on an easily readable dial, graduated in degrees.

ARMY E NAVY

Van Norman Milling Machines

VAN NORMAN COMPANY, SPRINGFIELD 7, MASS.

Landis Pipe and Nipple Threading Machines are used exclusively in this west coast installation. Illustrative of the production obtained, a 1-1¼" LANDMACO Machine averages daily 300 space nipples per hour, ¾ inch pipe size, and maintains an average of from 3000 to 5000 threads per grind of the chasers.

LANDMACO

Pipe and Nipple MACHINES

SPEED THE PRODUCTION OF NIPPLES

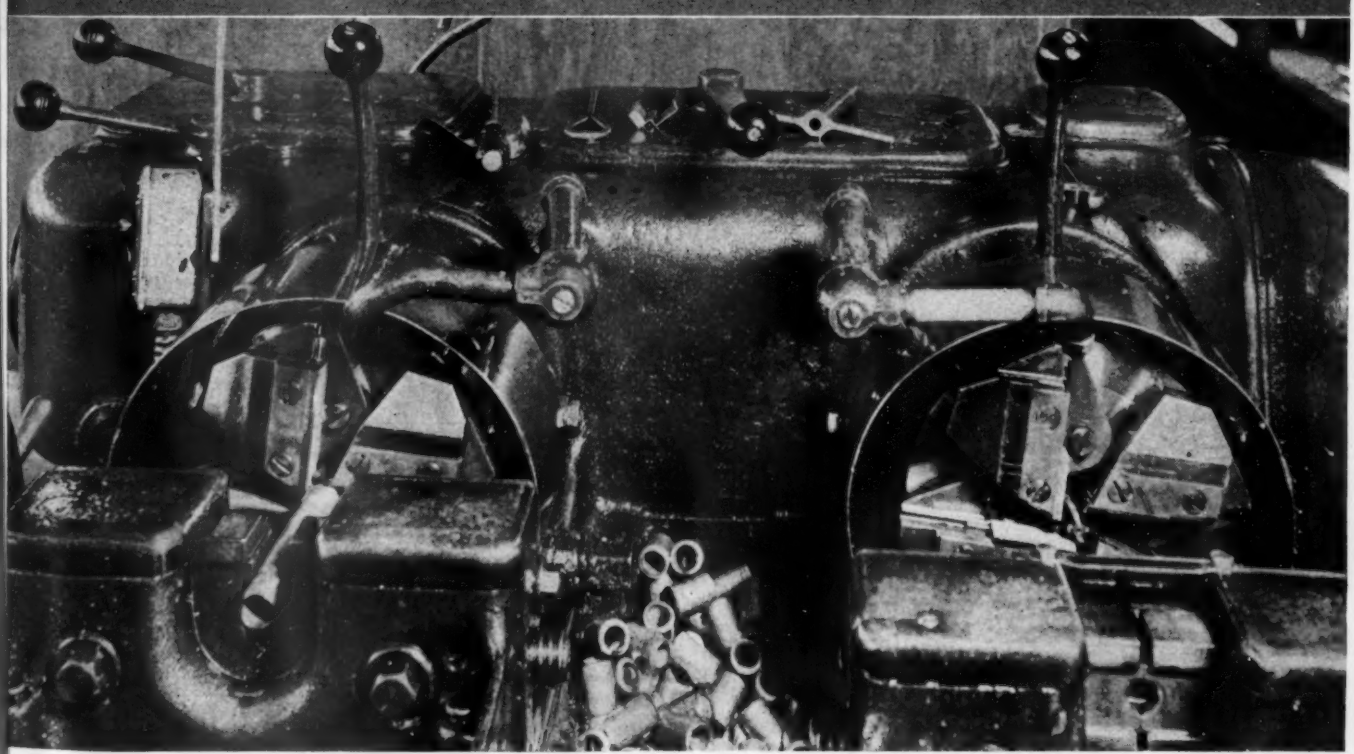
Accurately tapered threads of uniform length are assured with LANDMACO Pipe and Nipple Threading Machines.

Manufacturers everywhere employ the LANDMACO Threading Machine equipped with the LANCO Internal Tripped Semi-Receding Head for the high production threading of nipples. The LANCO Internal Tripped Head both reams and chamfers the pipe during the threading operation and opens automatically at any pre-determined thread length, which assures the production of cleanly cut, accurately tapered threads, of uniform length.

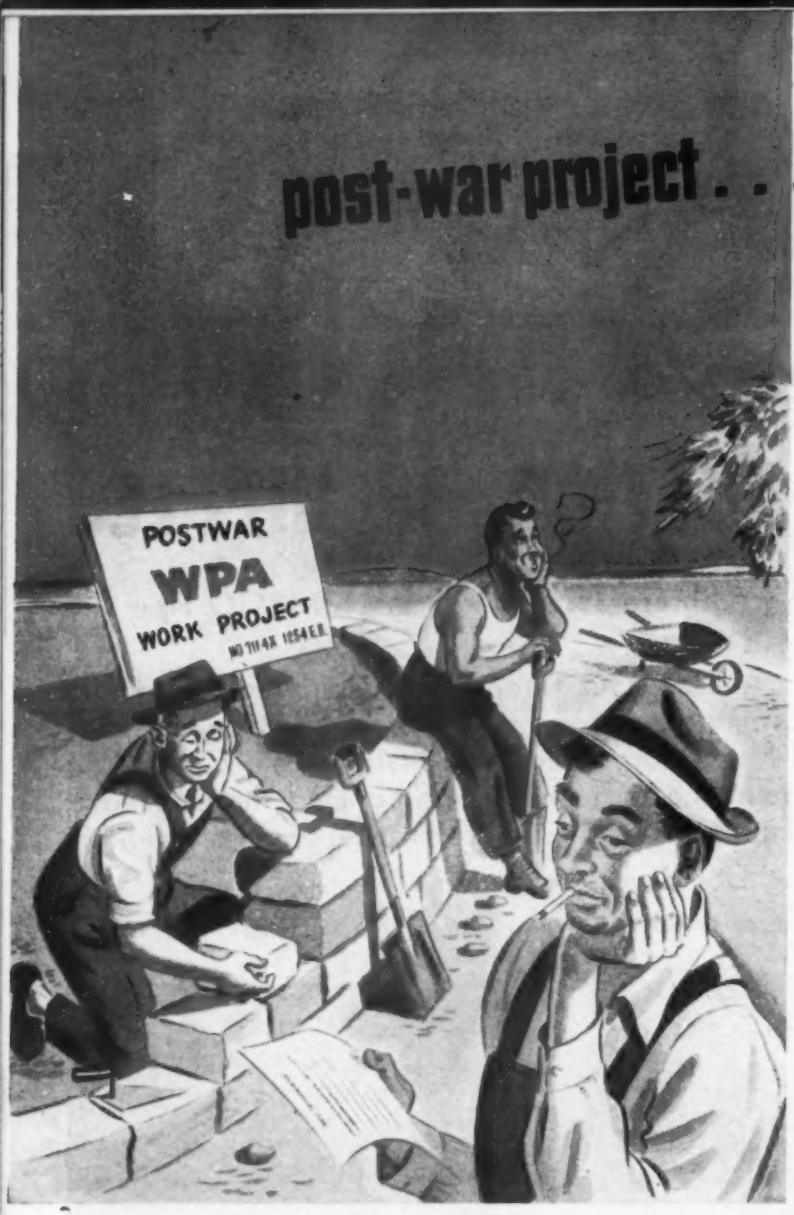
High Production and Minimum Threading Cost is Assured.

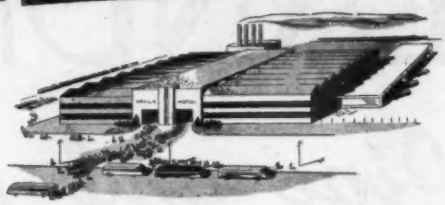
Write for Bulletin D-84 descriptive of* LANDMACO *Pipe and Nipple Machines

MACHINE CO. WAYNESBORO PENNA. U.S.A.



post-war project . . . or post-war planning?





Project: *A scheme*
Plan: *A method of action*

Today, progress is being made on two plans. The first is the "V" Plan. The second is the Post War Plan. Its success is vital to the peace at home after the victory abroad.

The "V" Plan is unified; the Post War Plan is not. Each country, community, association, company and certain individuals has its own. With so much effort from so many sources being exerted in the one direction, however, post war planning bids fair to achieve some of its objectives. For example:

The National Association of Manufacturers (14 West 49th St., New York City 20) has developed several guide books on post war planning. One of the objectives discussed in the first booklet is: "Seek to Reduce Costs." In substance it suggests that manufacturing, sales and operating costs should be reviewed to enable a corporation to operate profitably in a highly competitive economy.

Have you given real thought to retooling for the "peacework" future? New LeBlond lathes do two jobs as one, better and faster . . . they turn a profit as they true your product. Your resolve to retool is our time to serve.

THE R.K. Le BLOND MACHINE TOOL CO., CINCINNATI, 8

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- ☐ HEAVY DUTY GEARED HEAD GAP LATHE
- ☐ SUPER REGAL GEARED HEAD LATHES
- ☐ RAPID PRODUCTION LATHES
- ☐ AUTOMATIC CRANKSHAFT LATHES
- ☐ No. 2 CUTTER GRINDER

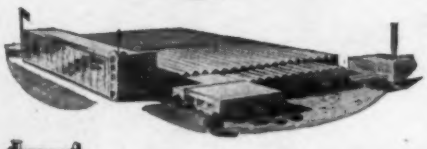
YOUR NAME _____ TITLE _____

YOUR FIRM _____ ADDRESS _____

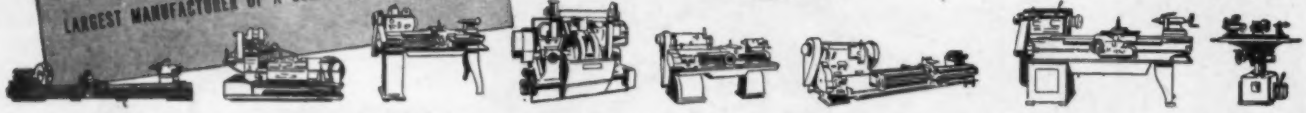
time to retool
Turn to Le Blond for Turning Equipment
LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES

ARMY E NAVY

LE BLOND



★ YOUR BONDS BUY BOMBS ★
BUY A "BLOCK-BUSTER" TODAY!



HD Engine Lathes—Nine sizes ranging from 12" to 50" swings. For versatility in turning.

Automatic Lathes—12" & 16" Mechanical or Hydraulic power.

Super Regal Lathes—Six sizes, 13" to 24" Best for training.

Automatic Crankshaft Lathes—For all facing, turning, finishing, pins.

Tool Room Lathes—12", 14", 16" and 18" swings. Versatile.

HD Gap Lathes—Ten sizes in Regular and Sliding Gap models.

Rapid Production Lathes—13", 17", 20" swings. Six speeds. Faster output. Lower cost.

No. 2 Cutter Grinder—Internal, cylindrical, face- and angular work.

TARGET *for* TOMORROW

★ All Metal-Working can use METRO Tools and Gages advantageously and economically for maintaining production accuracy tomorrow just as they are today.

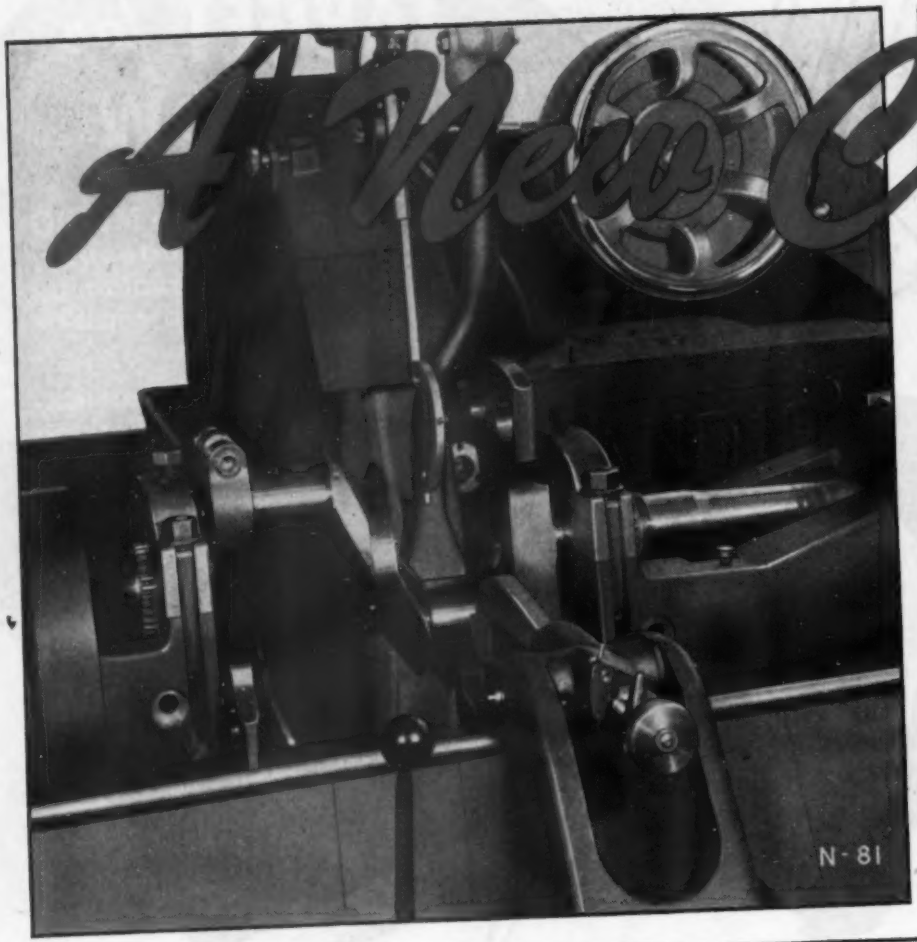
METRO'S complete tool and gage service is available to all Metal-Working Plants. Send for catalog 102.

METRO TOOLS and GAGES

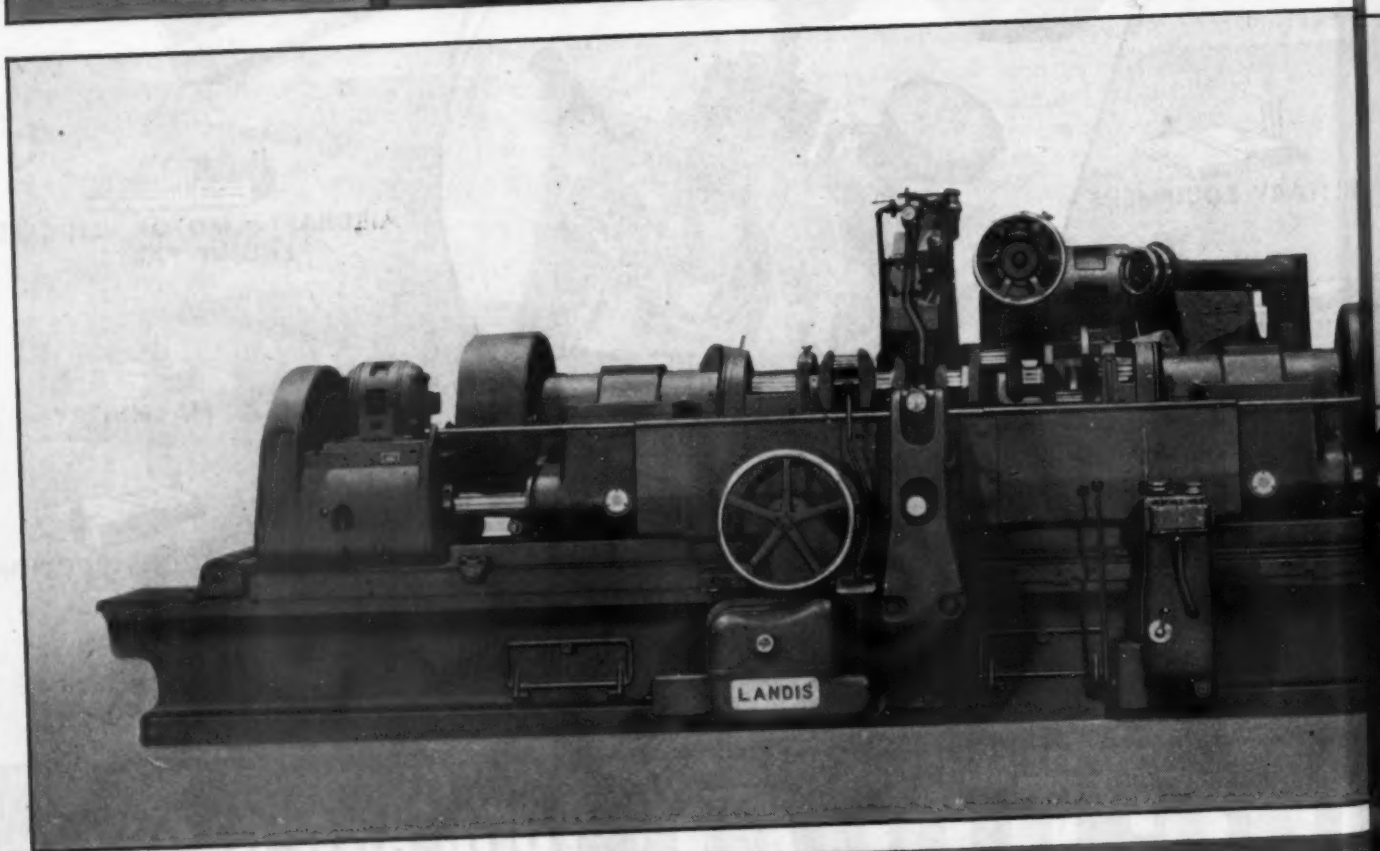
METRO

TOOL AND GAGE CO.

4240 PETERSON AVE.
CHICAGO, 30, ILL.



A New Crank



Unusual Performance as

Pin Grinder

THE LANDIS 25" TYPE-DD

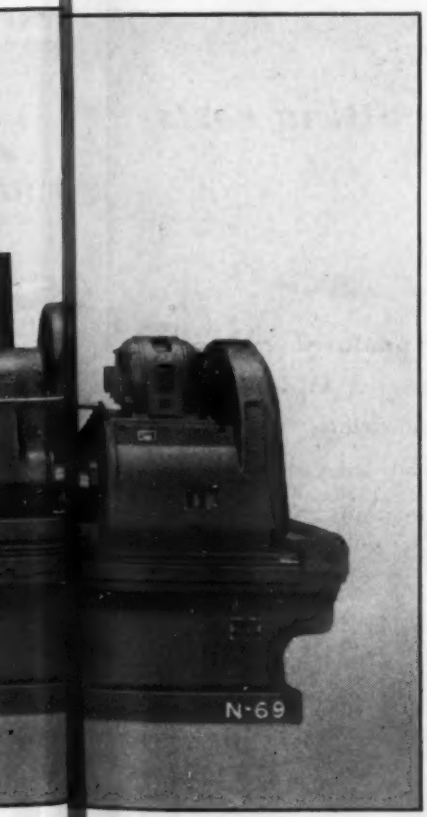
PRECISION LANDIS GRINDERS

Here illustrated is the newest Landis Crank Pin Grinder. Designated as the 25" Type DD, it is already making a name for itself in numerous large plants where the demand is for close accuracy, coupled with high output.

. In the shorter lengths, the Type DD is recommended for radial engine crankshafts and for in-line liquid cooled engine crankshafts. Many of the smaller Diesel engine shafts may be handled by the longer machines.

Certain basic Landis Crank Grinder features are continued in the Type DD. The new features include:

1. Dual work drive arrangement which eliminates or minimizes crankshaft axial deflection.
2. Provision for quickly and efficiently correcting any out-of-balance condition of the crankshaft.
3. Rugged 5/8" movement shoulder grinding attachment, suitable for rapid metal removal.
4. Massive bed mounted stationary work rest with quick acting shoe movement control.
5. Landis hydraulic straight infeed with 12" rapid feed, required because of the large flanges inherent in the design of some airplane cranks.



The machine to the left is a 25" x 48". Three other lengths—80", 96" and 120"—may be had. If you are a crankshaft manufacturer, write us for more information relative to the production-improving and cost-reducing possibilities of the new Landis Type DD.

415

LANDIS TOOL CO.
WAYNESBORO—PENNA.

s Usual

There are many GOOD THINGS AHEAD . . .

Fins applied to the sides of aircraft tires have been found to reduce wear. When the landing gear is lowered, the air pressure spins the wheels and reduces the scuffing of the tires in their first contact with the ground.

The formerly worthless scrub palmetto, which grows like a weed on the Gulf Coast of Florida, is now ready to supply material for wallboard, brushes, binder twine, upholstery, insulation, and for use as a reinforcement for plastics and Portland cement.

A plastic molding powder is being made from potato starch.

Some engineers foresee the time when the refuse of cities—garbage, ashes, paper, etc.—will be removed continuously by underground tubes and burned in large incinerators to furnish power.

Shells are being tested by a new variation of the old trick of dropping a coin on the counter. When dropped on metal plates, the perfect shells make a particular sound that is detected and reported by an electronic "ear".

A fine finish may be put on stainless steel inexpensively by means of a newly patented electrolytic process.

The strength of spot-welded aircraft joints is being successfully tested by X-ray.

Because of its peculiar stretch and slow recovery, as well as its light weight and resistance to rot, Nylon rope is expected to have many postwar uses where a shock absorbing effect is required.

A new flexible tubing is made of woven glass fiber covered with plastic.

A new street cleaner sucks up leaves and compresses them for fertilizer.

A new ignition cable is made of monel and is insulated with synthetic rubber and glass fabric.

Pure tungsten can now be produced directly from the ore by a newly reported electrolytic process.

A patent assigned to a large truck manufacturer permits the conversion of a regular truck to a half-track crawler.

The Office of War Information has an exhibit of new materials, methods, and products in the Social Security Building in Washington.

Echo sounders, intended to measure the depth of water under a ship, are being used to locate schools of fish.

Experiments are being made with alloys of wrought iron and nickel.

Machinery has been designed for the high-speed, mass-production baking of bread with infra-red lamps.

Neon lights will be standardized in 98 colors.

Several manufacturers of air-conditioning equipment are working on plans for a $1,000 unit suitable for a six-room house.

At least 30 aircraft parts of laminated plastic paper are in production.

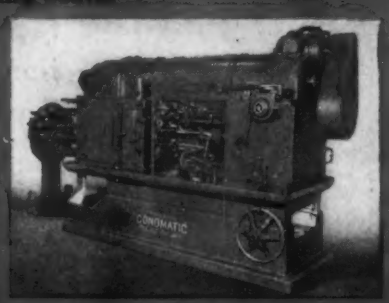
Lamp bulbs are being made shatterproof by a coating of lacquer.

A new double-barrelled spray gun that can handle two fluids at once has just been patented.

A novel mail box answers audibly any spoken request for the zone number of any address in the city.

When you look ahead
Look at metal cutting costs

This part was produced on an 8 Spindle Conomatic from SAE 4615 seamless tube stock. The 16 machining operations, performed without rehandling, include hole and groove burnishing, threading, and internal recessing. Time—37 seconds. Conomatics cut metal cutting costs.



CONE

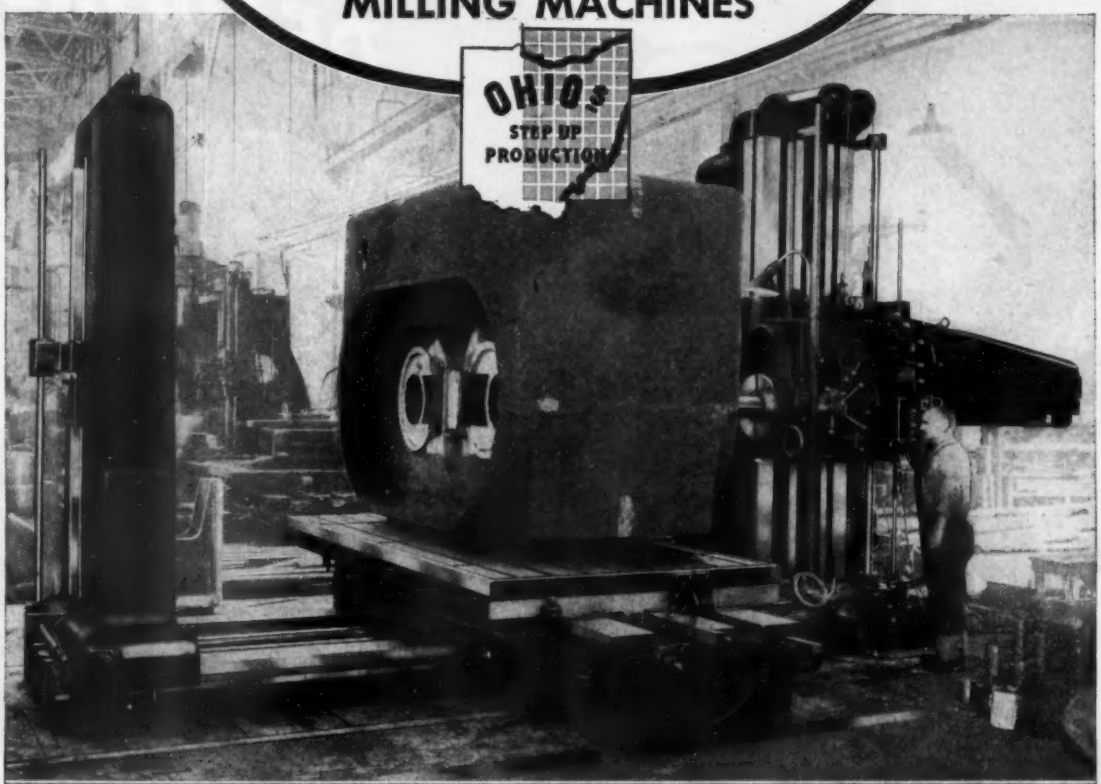
AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U. S. A.

6

Orders for Ohio Horizontals are being shipped with reasonable promptness.

OHIO HORIZONTAL

BORING, DRILLING AND MILLING MACHINES



Ohio Horizontals are built in a heavy duty type with 5" spindle and in an extra heavy duty Dreadnaught type with either 5" or 6" spindle.

You find in Ohio Horizontal Boring, Drilling and Milling Machines all the underlying stamina necessary to cope with increasingly severe operating conditions. That stamina forms a basis for Ohio's well known power and precision, with convenience and safety . . . Typical features: unit construction, nitrided spindle, anti-friction bearings, built-in electrical power rapid traverse, narrow guide construction for all moving parts, push-button control for start-stop, forward-reverse and run-jog of the spindle, continuous spindle feed of 72" with full-length spindle support, internal gear-tooth type clutches, automatic lubrication, multiple-splined shafts with splines milled from the solid for all sliding gears and clutches . . . We offer also a full range of accessories and attachments.

Get our well illustrated Bulletin 300

THE OHIO MACHINE TOOL COMPANY • KENTON, OHIO

OHIO DREADNAUGHT

HORIZONTAL BORING, DRILLING AND MILLING MACHINES • SHAPERS • PLANERS

In a Rush for Gages?

CADILLAC
Thread
GAGES

WIRE YOUR ORDER Today!

ALL STANDARD SIZES

NATIONAL FINE
NATIONAL COARSE
0-80 to 1½-6
ALSO
PIPE PLUG GAGES
⅛ to 1¼

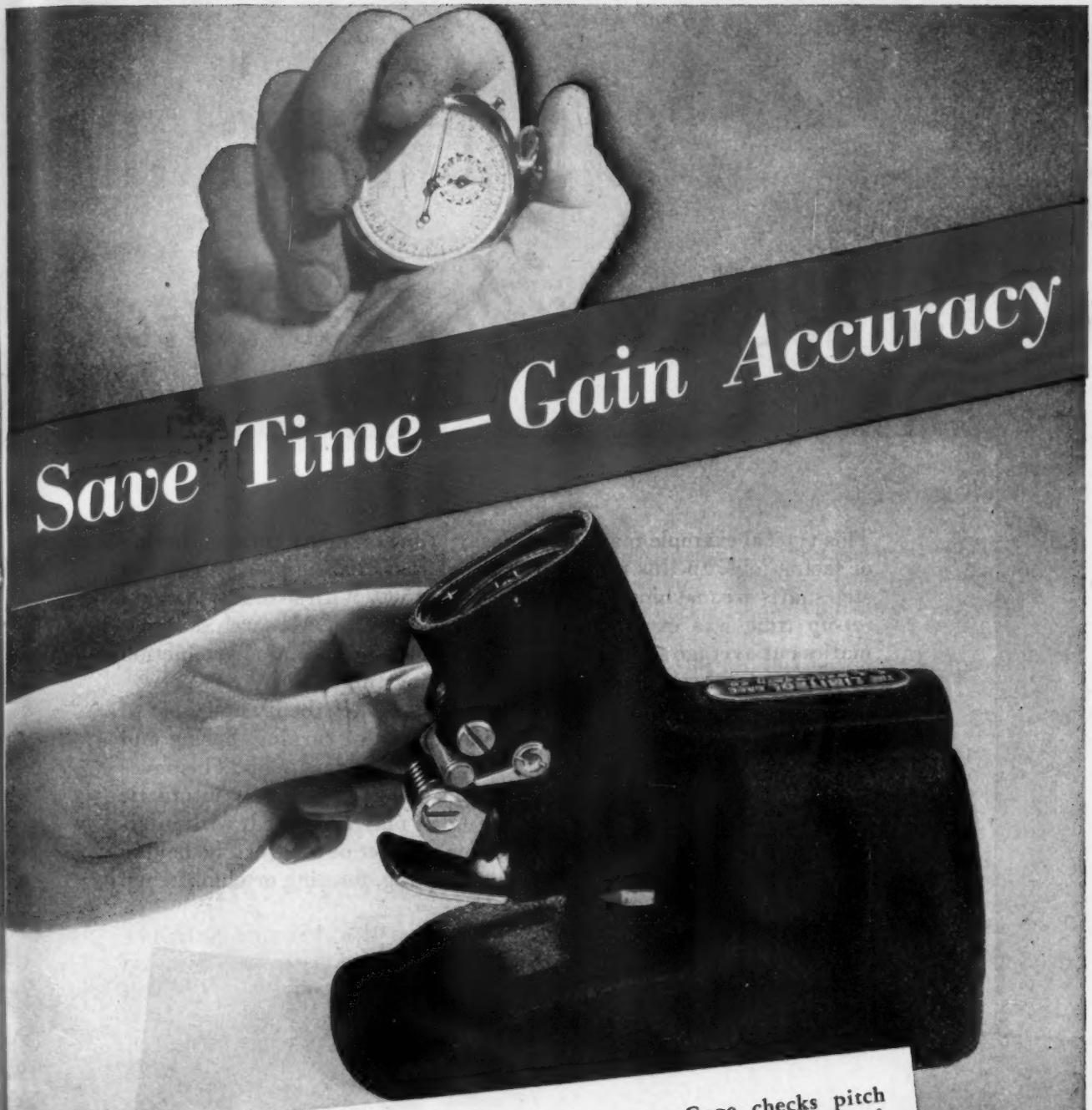
IF you're in a fix because, in the wartime rush of trying to do several things at once, you overlooked ordering Thread Plug or Thread Ring Gages for a particular checking operation, Read on and you'll see that your worries are over!

From the large stock-pile that we have built up to meet emergency needs, we can ship you practically any standard size of Thread Plug or Ring Gage as soon as you give us the word. Barring unforeseen events, such as a suddenly increased demand for some particular size, we are in a position to get your shipment off to you the same day your order is received.

And remember, along with speedy delivery you also get the ultimate in quality and painstaking workmanship. Used by leading manufacturers for inspection work requiring the highest degree of accuracy, Cadillac Gages are acknowledged as being unsurpassed for the precision gaging of external and internal threads.

CADILLAC THREAD GAGES CADILLAC

CADILLAC GAGE COMPANY, *Detroit 5*



Save Time — Gain Accuracy

Speed up inspections with greater accuracy. The new LIMITROL GAGE by Woodworth is breaking all records for fast, accurate inspections. In many cases LIMITROL has cut inspection time to one-fourth that of other gaging methods. The Woodworth LIMITROL Comparator Gage checks pitch diameter, lead, taper, angle, out-of-roundness and straightness. It eliminates "feel," reduces scrap and cuts inspection costs by combining greater speed with greater accuracy. Write for your copy of LIMITROL catalog No. 44-L.

ACCURACY YOU W CAN TRUST

WOODWORTH

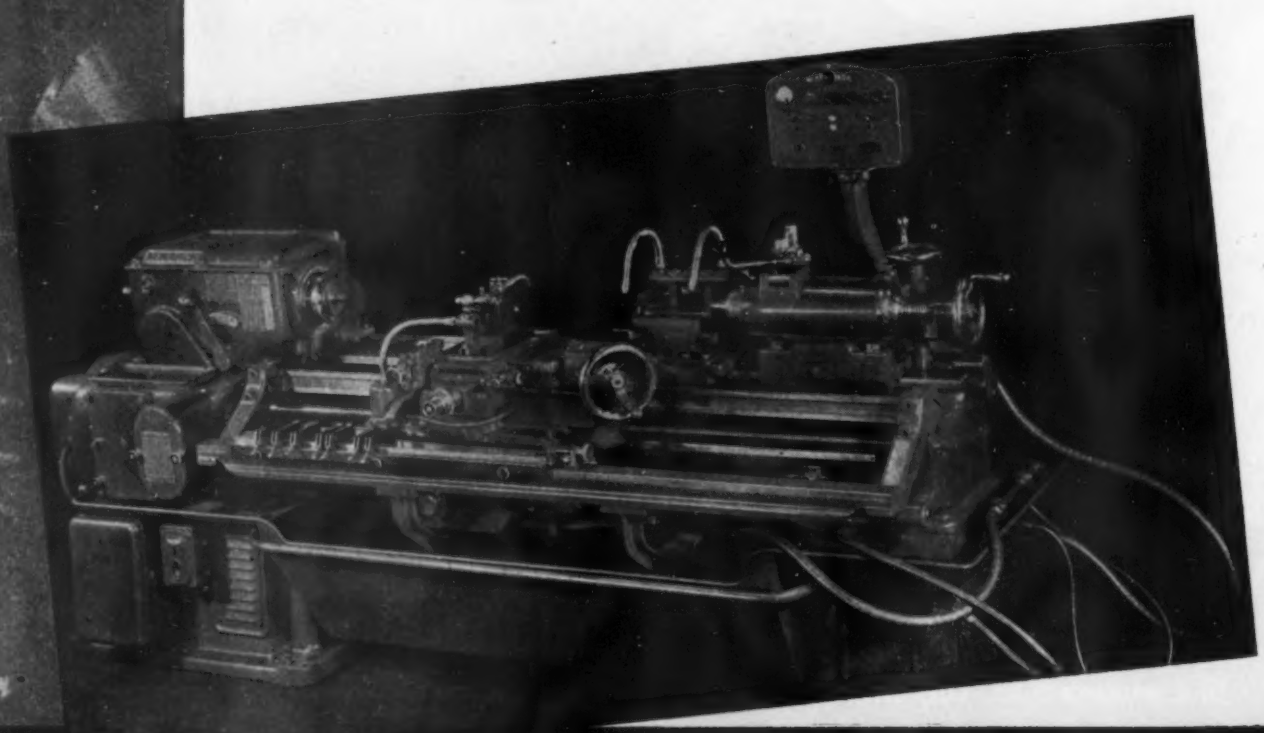
N. A. WOODWORTH CO., SALES DIVISION, 1300 E. NINE MILE ROAD • DETROIT 20, MICHIGAN

PRECISION GAGES • GROUND THREAD TAPS • FORM TOOLS • PRECISION MACHINED PARTS • HEAT TREATING • PLATING

SAVES 40% MACHINING TIME AND SHAPES *with Monarch*

This typical example may help you save time on many turning, boring or facing jobs. In this plant in a normal year, 700 sizes and shapes of step shafts are machined in lots of from 5 to 500. With so many changes, set-up time was excessive. Putting the work on Monarch Magnamatics cut average set-up time to 10 minutes, and increased production to show a total saving of 40% in machining time.

The flexibility of Monarch Magnamatics makes them applicable to wide variety of work. Diameters and lengths for turning, boring and facing are gaged by electrical switches, using standard tools. This saves set-up time and permits most turning jobs to be put on a fully automatic basis. Any number of diameters or lengths may be turned, with intervening tapers or contours. A reasonable number of tools can be held in the rear carriage tool slide for facing, necking, forming or chamfering.



THE MONARCH MACHINE

Notice convenient control panel which centralizes all electrical controls, and makes possible unprecedented flexibility. After set-up is complete, the start cycle switch at lower right of panel is the only one needed to start each automatic cycle.

Thus Monarch Magnamatics can break up bottlenecks, relieve man-power shortage (one man can tend several Magnamatics, depending upon the work) and without retooling can quickly be put to peacetime production. For War work, reasonably prompt deliveries can be made.

Our engineers will gladly furnish time estimates and production data. Address the factory or our nearest factory branch or representative listed below:

622 W. Washington Blvd., Chicago
801 Fisher Bldg., Detroit
Liberty Ave. & Stanwix St., Pittsburgh
10465 Carnegie Ave., Cleveland
1060 Broad St., Newark
Representatives in principal cities

• • •

ADVANTAGES OF THE MONARCH MAGNAMATIC

The Magnamatic is a 10 hp, fully automatic electrically controlled lathe for turning, boring and facing, including tapers and contours, and is without doubt the most universal automatic lathe ever built. Consider these advantages:

FOR SHORT RUNS

1. Quick set-up.
2. Inexpensive tooling.
3. Elimination of all cams.
4. Provides automatic production for small runs, thus lowering unit costs.

FOR LONG RUNS

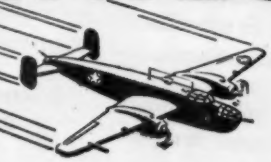
1. Saves time on set-ups and in resetting tools after grinding.
2. Saves time in loading.
3. Full automatic cycle enables one operator to tend two or more machines.

IN MOST PLANTS

1. Not a single purpose machine.
2. Quick conversion to peacetime work.
3. Easy to set up—fast in operation.
4. Requires less skill than usual for automatic machines.

MONARCH LATHES

Save Time



TOOL COMPANY · SIDNEY, O.

Re-examine your tooling for cost reduction

Production costs can be cut when a tool steel fully meets specific requirements

The urgent need for speed in wartime tooling has compelled many toolrooms to accept compromises in materials and methods. As a result short tool life, hardening difficulties and too frequent regrinds have affected costs and tool performance.

With the initial tooling-up job well in hand in many plants, now is a good time to smooth out some of these wartime tooling problems and look for ways of reducing costs and improving performance.

Check over the specific requirements of each job. See which of the following properties are needed to provide longer tool life—higher output with fewer regrinds—lower tool cost:

Greater wear resistance
Higher impact strength
More toughness
Greater accuracy in hardening
Greater hardening safety
Greater red-hardness

To help you get the specific results you want, Carpenter provides a simplified guide to tool steel selection—a diagram of nine Matched Tool Steels—that will solve over 90% of all the jobs that will come up in your toolroom.

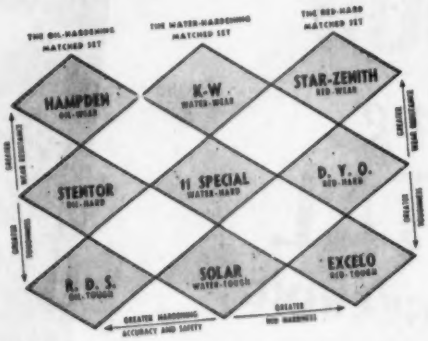
Re-examine your tooling program. Find out how this method can help you cut costs and increase production. If you are responsible for tooling or tool production, write today on your company letterhead for a copy of the Carpenter Matched Tool Steel Manual. (Free to tool steel users in the U. S. A.)

The Standard Tool Steels of Industry

THE CARPENTER STEEL COMPANY • 109 W. Bern Street, Reading, Pa.

Available to help you cut costs and increase production

Nine Matched Tool Steels that will solve over 90% of your tool jobs



Why are they called "Matched Tool Steels"? Because each one picks up its job where the other leaves off. Before the tool is made you know what to expect in toughness, hardness, wear resistance and hardening behavior.

The matched set diagram makes it easy to select a steel that will give you the desired performance. Toolmakers say that this method of selection works like a charm.

To further insure your results, complete information on the properties and behavior of each tool steel is made available to you —together with detailed, easy-to-use heat treating instructions.

Carpenter Matched Tool Steels are available from conveniently located branch warehouse and distributor stocks. Your nearby Carpenter representative will be glad to check over your tool steel requirements and help you get the most from every pound of tool steel that you use.

185,000 more pieces per month—tool breakage eliminated

The Problem: Frequent breakage of the compound die for punching and coining this small part, indicated the need for extra toughness. Press rate was 1500 pieces per hour, tool replacement took an hour—no tool steel had lasted more than 20 minutes.

Results: A water-hardening tool steel could be used, so Solar (Water-Tough) was selected from the matched set diagram for maximum toughness. Tool breakage stopped and production between grinds jumped from 500 pieces to more than 10,000 pieces. Press shut-down time was cut 124 hours per month.

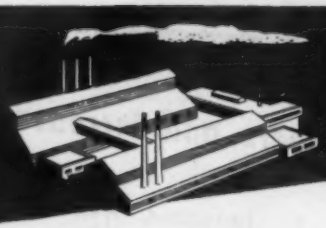
132 less tools per month for the toolroom to handle

The Problem: Greater wear resistance was called for in this extrusion die because abrasion grooved the dies in five days of operation. Half an hour production time was lost changing dies in a 30 opening extrusion press. An additional half hour per die was spent in toolroom repolishing.

Results: Hampden (Oil-Wear) was selected from the matched set diagram because it combined maximum wear resistance with accuracy in hardening. Time between polishing was increased from 5 to 42 days, shut-down time was cut 2.2 hours per month, 66 hours of toolroom polishing time per month were saved and there were 132 less tools per month to make or repolish.

Carpenter MATCHED TOOL STEELS

ANCHES AT Chicago, Cleveland, Detroit, Hartford, Louis, Indianapolis, New York, Philadelphia



AMERICAN INDUSTRY SAVES

$750,000,000

per year by using

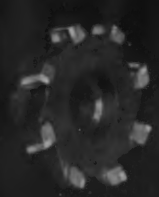
KENNAMETAL

PRODUCTS AND ENGINEERING

KENNAMETAL PRODUCTS

CUTTING TOOLS

Kennametal-tipped single-point tools are used in America's leading machine shops for turning, facing, and boring steel up to 550 Brinell hardness, cast iron, and the softer metals.



MILLING CUTTERS

Kennametal-tipped cutters have revolutionized milling practices by making possible the milling of all metals, including the toughest steels, at almost incredible speed.

WEAR RESISTING PARTS

Kennametal inserts are used to prolong precision machine performance by protecting the "wear-areas" against effects of friction, corrosion and erosion.

The carefully recorded experience of one of our customers for the year 1942 indicated that actual savings resulting from the use of Kennametal-tipped machining tools totaled $50,000. Projected to a national basis for the same year, American Industry saved approximately $750,000,000 through the use of Kennametal. In 1943, the widely extended application of Kennametal increased these savings correspondingly.

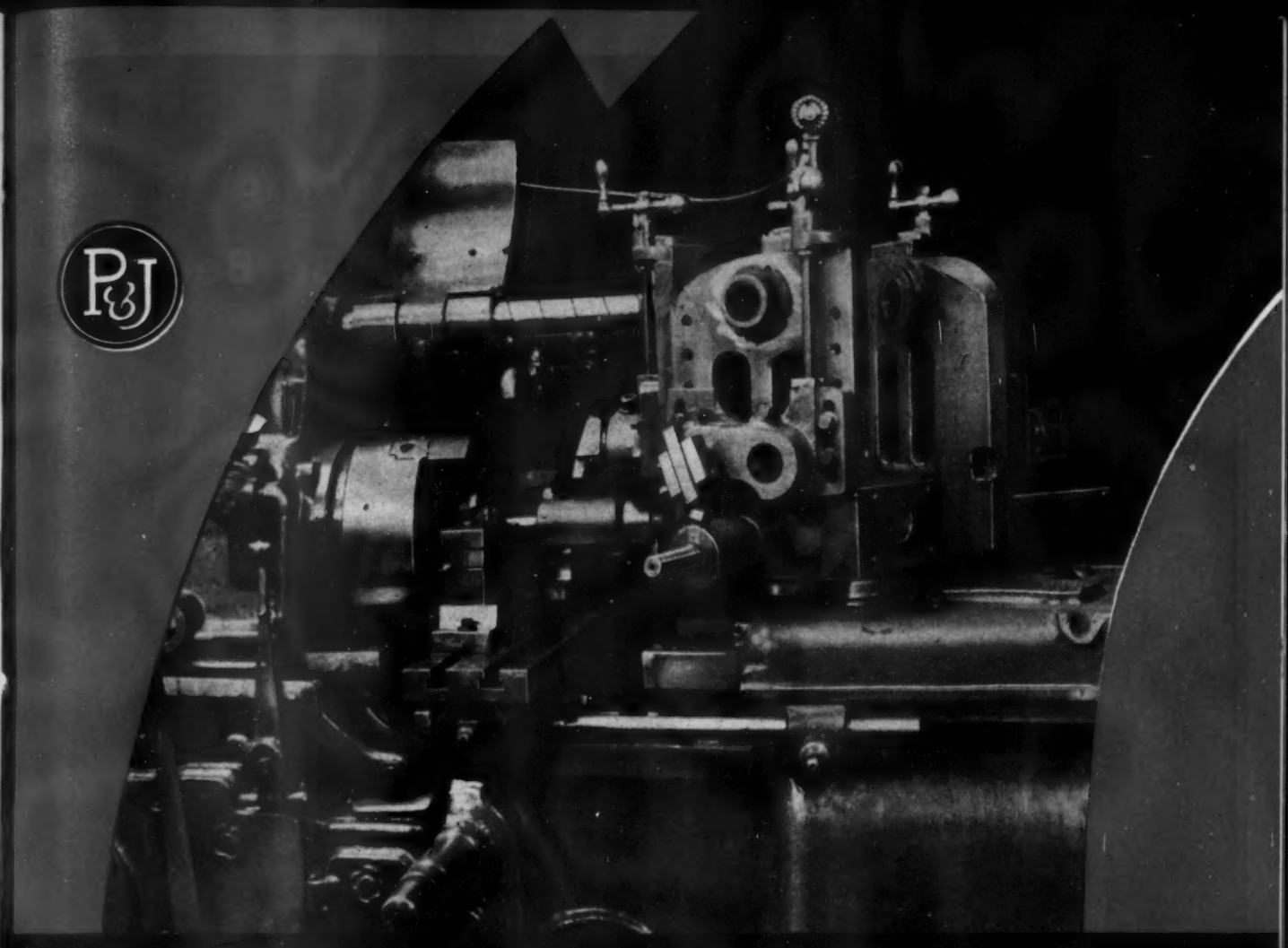
These are dollars-and-cents figures—figures in which industry is normally interested. But as American citizens, we are today even more interested in how the savings will help win the war—man-hours saved and production gained are the vitally important factors. Every faster cutting operation in your shop means faster cutting of the deep, straight paths of destruction that lead to Berlin and Tokyo. Shortening the job means shortening the war. Shortening the war means saving lives.

You can shorten machining time, and cut costs, by using Kennametal-tipped tools. Kennametal, a cemented carbide composition, contains a unique intermetallic compound (tungsten-titanium-carbide) that is unsurpassed, except for the diamond, in hardness. Our district field engineer can tell you how to use it for maximum metal-cutting results. Kennametal Catalog 43-C contains useful information on tool design, use, and maintenance. Write for it.

KENNAMETAL

R CEMENTED CARBIDES

KENNAMETAL Inc., 103 LLOYD AVE., LATROBE, PA.



RE-TOOLING . . . MAKES PRESENT P&J EQUIPMENT AVAILABLE FOR NEW WORK

Looking back to '41

The original tooling on this smaller 4-D P&J Automatic was designed for quick set-up and close tolerance fast machining of bearing cages. Floor to floor time was 3.27 minutes, a performance that even then would compare favorably with today's fast tempo on similar work.

Looking ahead . . . to New Work

P&J engineers have invariably anticipated future trends in the design of P&J equipment. By making *versatility* in tooling an inherent characteristic, they have provided for a wide latitude in changeover possibilities to meet future requirements. It is for this reason that P&J Automatics can be readily converted to handle new work by RE-TOOLING. It means that your present machines may be entirely adequate for the jobs that lie ahead.

Now is an opportune time to know for a certainty just what P&J RE-TOOLING can offer you. We have the experience and facilities to help you take fullest advantage of the *versatility* in which you invested when you installed P&J Automatics. You are invited to call on us for our assistance in meeting tomorrow's problem through P&J RE-TOOLING service.

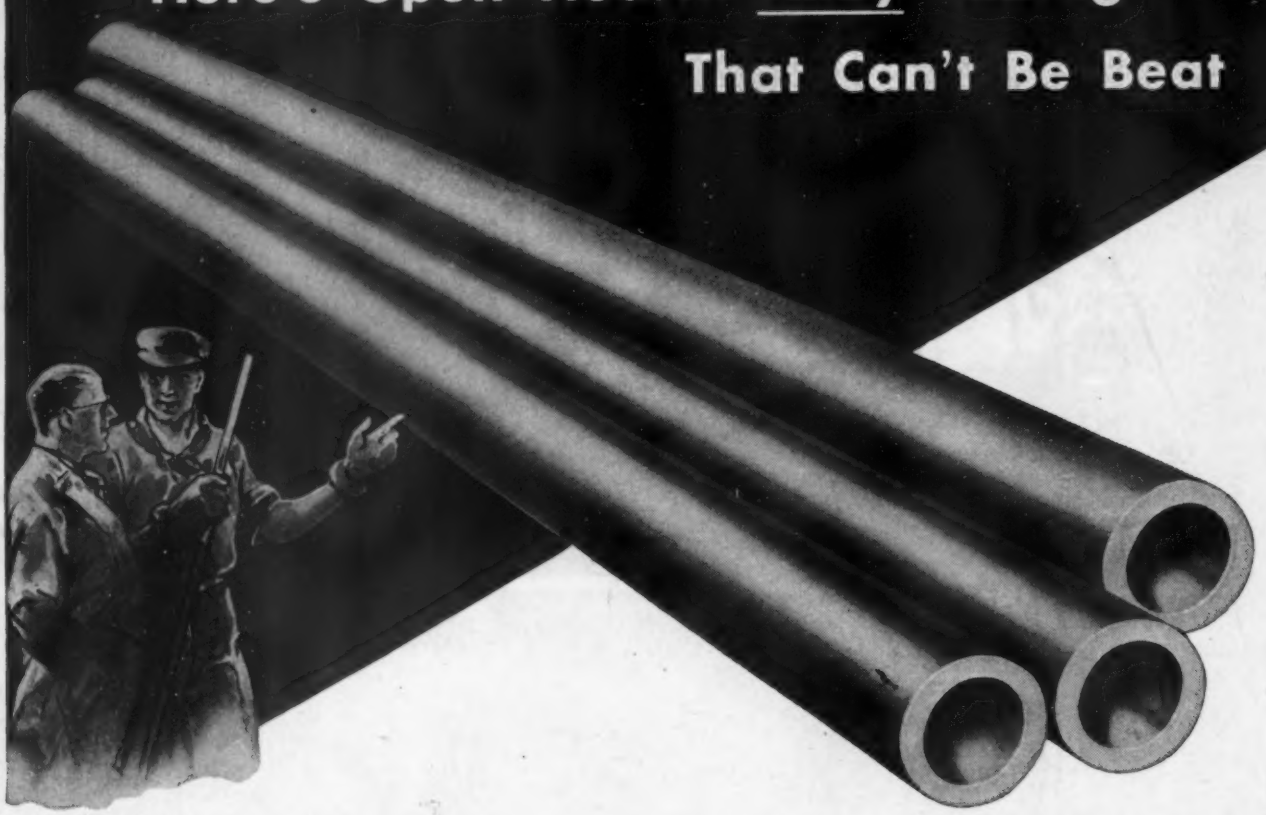
POTTER & JOHNSTON MACHINE CO., *Pawtucket, R. I.*

OUR BOYS
are buying **BONDS** *and* **FIGHTING**

P&J REBUILDING SERVICE

The service life of P&J Equipment can be reclaimed and extended with original accuracy and performance restored by rebuilding. P&J has set up a RE-BUILDING SERVICE in its plant which is available to present owners of this equipment. It will pay you to investigate and to have your machines retooled when they are rebuilt.

Here's Open-Hearth Alloy Tubing That Can't Be Beat



From long mastery of the art of making *good* open-hearth steel, plus new practices and experience given impetus by war demands, Pittsburgh Steel Company has developed the production of open-hearth *alloy steel* to a degree of perfection never before obtainable. When converted into Seamless Tubing the finished product is equal in quality to comparable grades made by other processes.

Sound steel plus the alloying "know-how," and complete uniformity of analysis, heat treatment and response, gives this *Pittsburgh Alloy Tubing* a utility range limited only by imagination. Wider use in aviation, automotive, marine, processing and other applications seems a certainty.

Demonstrating the high quality obtainable with these open-hearth alloys, orders for Pittsburgh Alloy Tubing to *Magnaflux specifications* have been filled without difficulty.

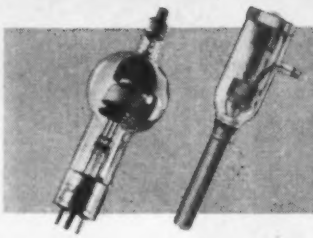
Send us your "specs" for analysis and recommendation.

PITTSBURGH STEEL COMPANY
1651 GRANT BUILDING · PITTSBURGH 30, PA.

Pittsburgh ALLOY STEELS

Billets, Bars, Wire and Tubing

Also Carbon and Stainless Steels



The G-E pliotron and G-E phanotron supply the high-frequency current for electronic heaters

ELECTRONIC heating for brazing, soldering, and surface hardening reduces operation time from minutes to seconds. High-speed production, in volume figures, may be attained with unskilled labor. Electronic heating causes no excessive scale or blackening—making cleaning easy.

Electronic heating makes it possible to apply the exact amount of heat at exactly the right spot—without affecting surrounding areas. In fact, the heating pattern may be so closely controlled that a completely uniform product may be turned out in volume. Single or multiple operations are readily possible. Illustrated is a typical assortment of parts brazed by electronic heating:

1. Threaded steel collar brazed to a steel elbow. 3000 parts per hour may be produced with one electronic heater.

2. Carboloy cutting tip brazed to ¾" steel tool shank. From 150 to 300 parts per hour may be produced with one electronic heater, depending on the set-up.

3. Threaded brass collar brazed to brass tube. 300 parts per hour may be produced with one electronic heater.

4. Tinned copper connections brazed to nickel-chrome resistance wire. 1500 parts per hour may be produced with one electronic heater.

There is a complete line of G-E electronic tubes for innumerable industrial jobs. Through its nation-wide distributing system, General Electric is prepared to supply users of electronic devices with replacement tubes.

"HOW ELECTRONIC TUBES WORK"

This booklet will be mailed to you on request—*without charge.* Address *Electronics Department, General Electric, Schenectady, New York.*

• *Tune in* "The World Today" *and hear the news direct from the men who see it happen, every evening except Sunday at 6:45 E.W.T. over CBS. On Sunday listen to the G-E* "All Girl Orchestra" *at 10 P.M. E.W.T. over NBC.*

G.E. HAS MADE MORE BASIC ELECTRONIC TUBE DEVELOPMENTS THAN ANY OTHER MANUFACTURER

GENERAL ELECTRIC

182-C6

SOLVE YOUR SPEED REDUCTION PROBLEMS

with Westinghouse Gearmotors

80% of all motor-driven machines, 1 hp and above, must operate at slower speeds than the motors which drive them.

Consequently, some type of speed reduction must be inserted between the motor and the driven machine. The best method of accomplishing this is by the use of Westinghouse Gearmotors which are slow-speed drives with high-speed motor efficiencies.

The product of more than 50 years of gearing experience, these Westinghouse units are designed, built, tested and guaranteed as single units.

Ask your Westinghouse representative about this new, efficient gearmotor. Consult with him about your present speed reduction problems or postwar plans.

Type C — A double-reduction unit for standard ratios from 7.6:1 to 25.7:1, inclusive.

Write for new gearmotor handbook, "Gearmotor Applications". Ask for B-3218. Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., Dept. 7-N.

J-07217

First of a series sponsored by Westinghouse to promote the use of gearmotors.

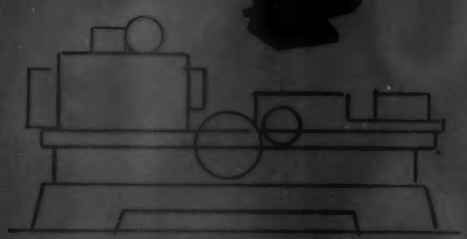
The New Westinghouse

PLANTS IN 25 CITIES... OFFICES EVERYWHERE

A GEARMOTOR IS THE MOST EFFICIENT MEANS OF SPEED REDUCTION

Because it offers:

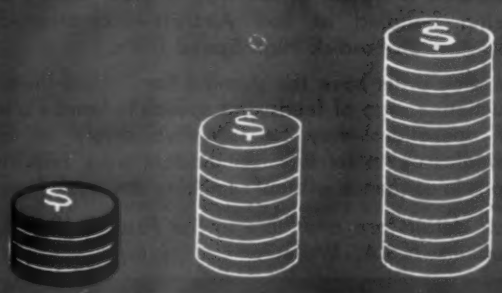
1 **COMPACTNESS . . .** it takes less space than any other form of parallel shaft speed reduction . . . makes belts, belt guards, pulleys, overhead line shafts *unnecessary*.



2 **LONG LIFE—MINIMUM MAINTENANCE.** A gearmotor has no belts, chains or ropes to replace . . . no multiple-parts to realign . . . no bearings to oil . . . no gears to grease. Probable maintenance consists of a twice-a-year oil change.

3 **EASE OF INSTALLATION.** By combining the prime mover and speed reducer in a single unit, the gearmotor is installed quickly and inexpensively.

4 **HIGH EFFICIENCY.** Only 2% power loss is involved in each stage of reduction . . . a single-reduction unit is 98% efficient; a double-reduction unit is 96% efficient. Compare this with the efficiency of other types of slow-speed drives.



5 **LOW OVER-ALL COST.** The initial installed cost of a gearmotor is usually lower than any other type of speed reduction. On the basis of maintenance and power losses, a gearmotor is *always* most economical.

6 **SAFETY FOR WORKERS.** A gearmotor has no exposed moving parts . . . no belts, pulleys, chains or ropes to endanger workers. It is totally-enclosed in a streamlined housing.

Gearmotors

Let's keep 'em

FLYING

by staying on the job longer

FOSDICK *High Speed* DRILLS

ARMY (E) NAVY

● As we move in closer and closer on our various battle fronts, the need for planes increases daily. Regardless of the number of planes they need—no matter what the objective may be—let's give them all the planes—tanks—guns—and ammunition they can possibly use on all fronts—when they want them.

To do this means that every man in our vast army of workers must stay on the job—all of the time to make sure we do not let our boys down at a critical moment.

At the Bell Aircraft Corporation a battery of Fosdick High Speed Drills are doing their part in drilling, reaming and boring parts for airplane construction. They are maintaining close tolerances and speeding up production of thousands upon thousands of critical parts. The machine illustrated is typical of the way a wide variety of jobs are being handled at Bell Aircraft—accurately—quickly—at low cost on Fosdick High Speed Drills.

Fosdick Drills have the stamina for "round-the-clock" production—range of feeds and speeds to handle a wide range of operations—may be furnished singly or in multiple spindles up to six to accommodate work requiring operations in sequence without removing the work from the jig.

Full details are available in the Fosdick High Speed Drill Bulletin—H.S.A. Write for a copy today.

FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, ··· OHIO

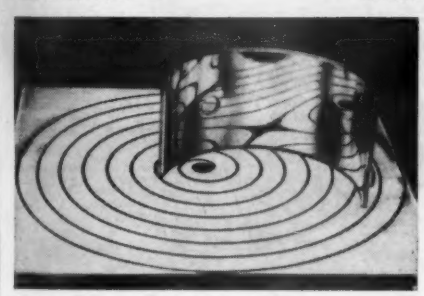
INSPECTION PROBLEMS?

Here's how Controlled Lighting saves time on tough inspection jobs

G-E REFLECTOR LAMP

REFLECTING MIRROR

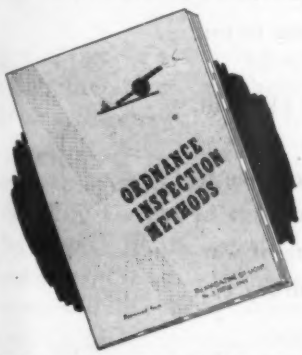
TO look inside a 75 mm. shell was difficult . . . until G-E lighting engineers helped work out a faster, more accurate inspection method. A standard G-E reflector lamp with a mirror arrangement "turns shells inside out"—makes sure there's no grease, dirt or pitting. It's a typical example of inspection methods that use controlled lighting . . . and it's another instance where G-E engineers have helped to gain faster, better inspection methods.



1 Brightness contrast patterns are useful for the inspection of chatter in polished metallic surfaces. Reflections reveal defects of unevenness and other irregularities.

2 Luminous panels permit accurate checking of cloth seams, weave and finish. Shown above, this type of inspection permits accurate examination of all seams in pilot parachute manufacture.

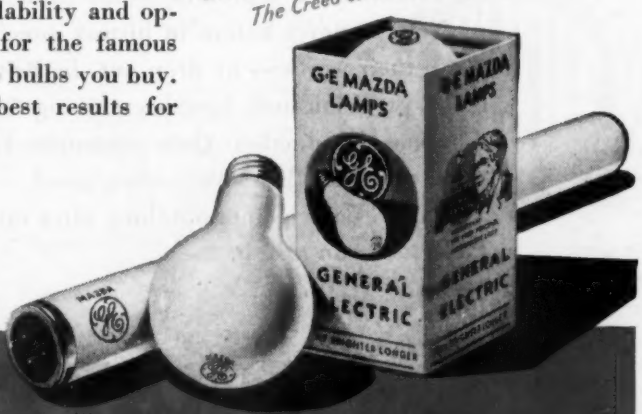
3 An inspection unit developed specifically for cartridge case inspection. It makes use of reflected light from mirrors, showing the interior and primer cup end of the cases.



In these special applications—or in standard lighting installations—be sure you get the utmost in dependability and operating efficiency. Look for the famous G-E monogram on all the bulbs you buy. It's your assurance of best results for every lighting purpose.

"TO MAKE LAMPS STAY BRIGHTER LONGER"

The Creed of G-E LAMP RESEARCH



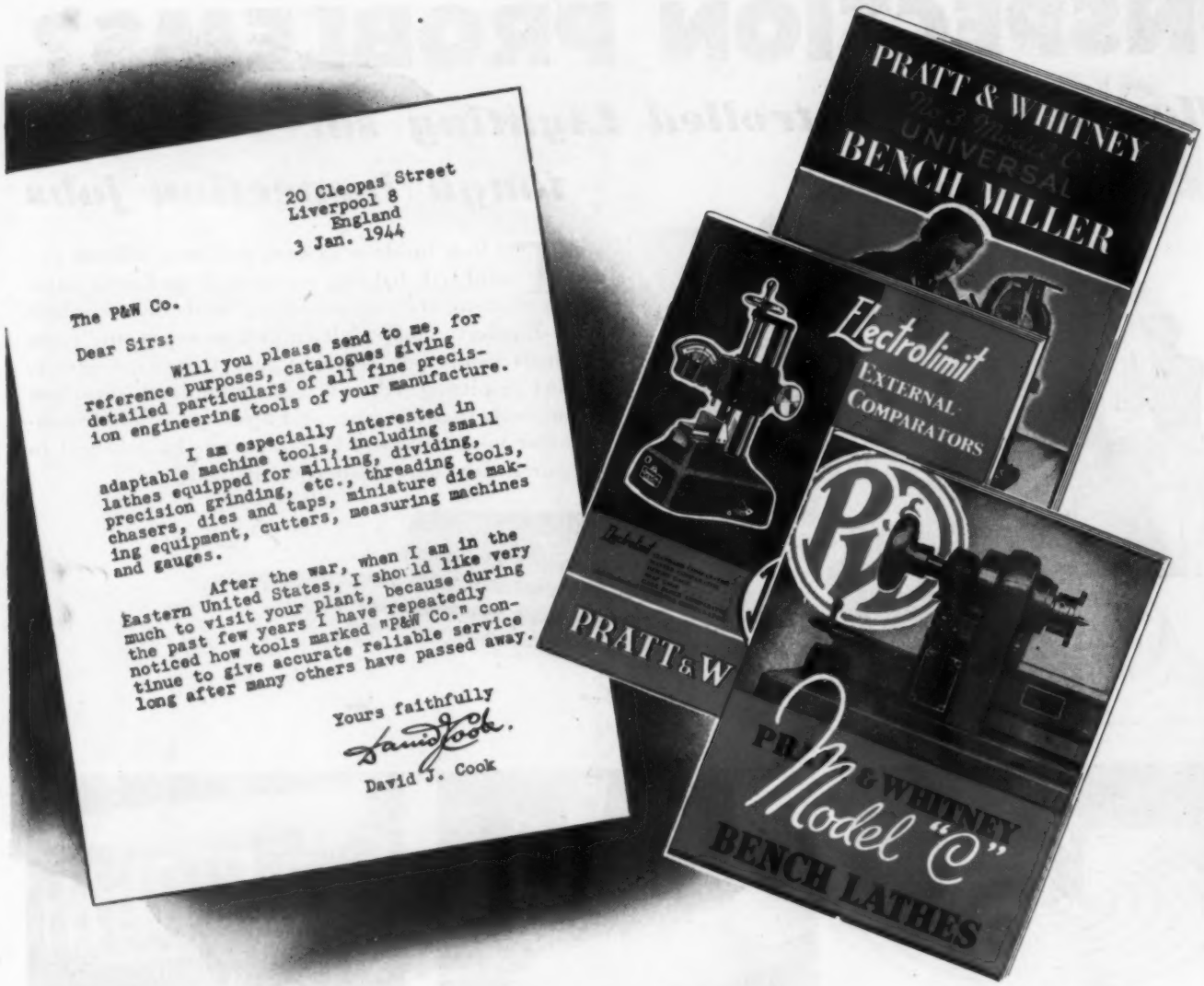
Send For New G-E Booklet That Gives The Facts On Lighting For Inspection. Write to General Electric Co., Dept. AM-3 *Nela Park, Cleveland, O.*

LET'S ALL BACK THE ATTACK—BUY ANOTHER BOND THIS MONTH!

G-E MAZDA LAMPS

GENERAL ELECTRIC

Hear the General Electric radio programs: "The G-E All-Girl Orchestra" Sunday 10 p. m. EWT, NBC; "The World Today" news, every weekday, 6:45 p. m. EWT, CBS.


20 Cleopas Street
Liverpool 8
England
3 Jan. 1944
The P&W Co.
Dear Sirs:
Will you please send to me, for reference purposes, catalogues giving detailed particulars of all fine precision engineering tools of your manufacture.
I am especially interested in adaptable machine tools, including small lathes equipped for milling, dividing, precision grinding, etc., threading tools, chasers, dies and taps, miniature die making equipment, cutters, measuring machines and gauges.
After the war, when I am in the Eastern United States, I should like very much to visit your plant, because during the past few years I have repeatedly noticed how tools marked "P&W Co." continue to give accurate reliable service long after many others have passed away.
Yours faithfully
David J. Cook
David J. Cook
PRATT & WHITNEY
UNIVERSAL
BENCH MILLER
Electrolimit
EXTERNAL
COMPARATORS
PRATT & WHITNEY
Model "C"
BENCH LATHES

"They're in the mail, Mr. Cook"

Needless to say, we lost no time in forwarding all necessary information to our appreciative customer across the Atlantic.

This message of commendation from overseas illustrates, as nothing else can, the fulfillment of a promise — the promise of fine tool-making.

Now, as never before in history, precision tools are being given a chance to prove their worth — or drop out. In Britain, for even more years than here at home, precision tools have been taking the terrific, high-pressure beating of wartime mass production. Only phenomenal toughness and complete accuracy can stand up under this never-ending grind.

As Mr. Cook points out, long after other tools have reached the scrap-pile, *P&W tools can take it.*

PRATT & WHITNEY

Division **Niles-Bement-Pond Company**

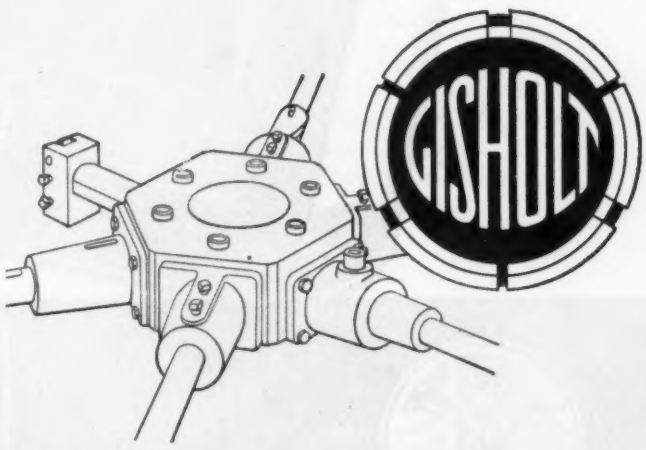
WEST HARTFORD • CONNECTICUT

ACCURACY . . . *for years to come*

If you've ever wondered why it is that Gisholts maintain their accuracy through so many long years of service, the answer is not hard to find.

It begins with Gisholt's heavy, rigid bed and headstock, cast as a unit to prevent distortion, to absorb vibration. Hardened steel ways are ground in perfect alignment with the spindle—and they *stay* that way. The husky spindle, of forged carbon steel, is mounted between widely spaced tapered roller bearings to assure lifelong accuracy and stability. The flanged spindle nose maintains accuracy as chucks, face plates and fixtures are changed.

These, of course, are the most obvious reasons for Gisholt accuracy. But careful attention to every detail from selection of steels to positive force-feed lubrication enables you to maintain close tolerances *now*—and many long years from now.



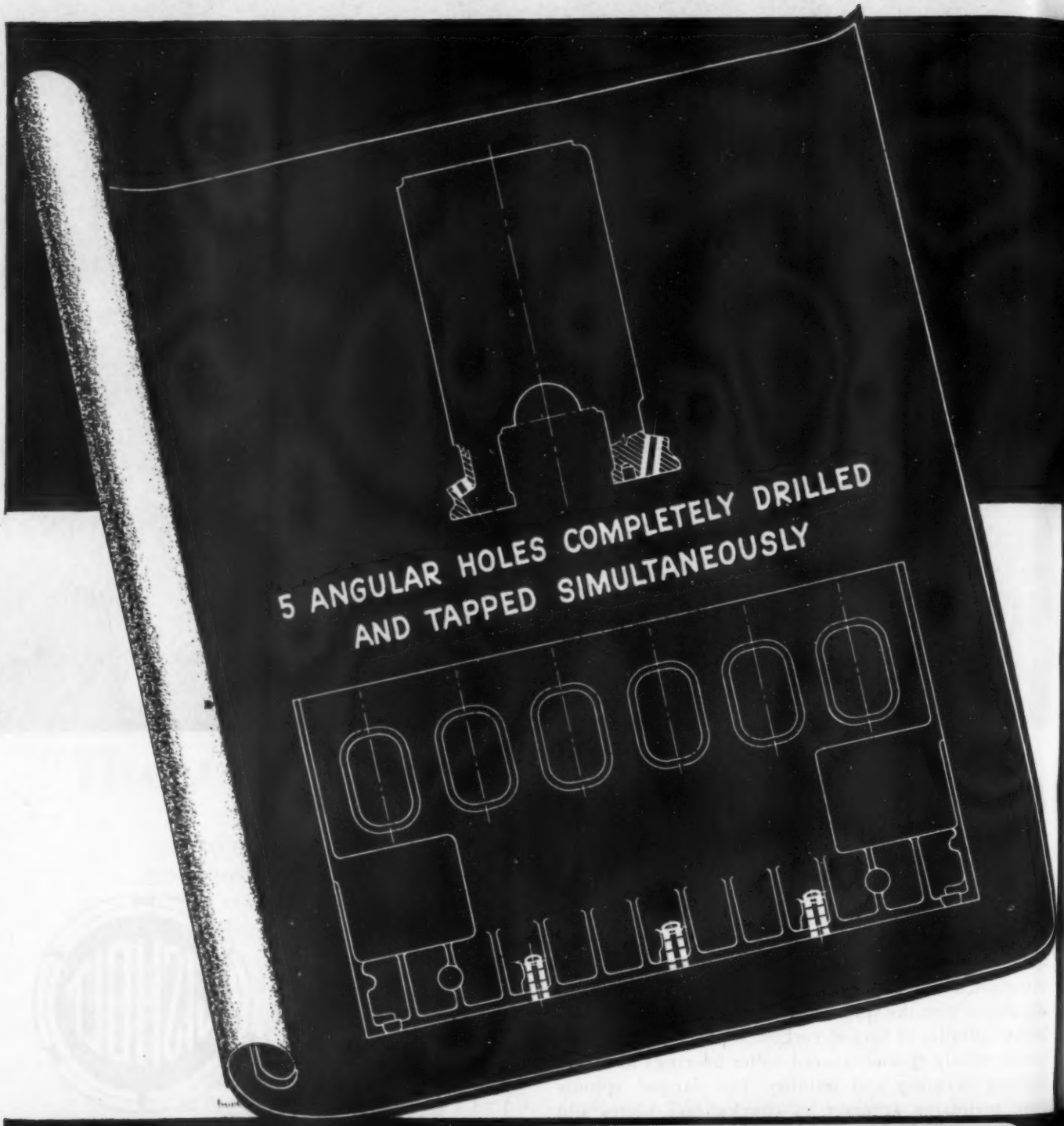
GISHOLT MACHINE COMPANY
1201 East Washington Avenue • Madison 3, Wisconsin

Look Ahead . . . Keep Ahead . ! !
With Gisholt Improvements in Metal Turning

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

AUTOMATIC

LOADING
CLAMPING
EJECTION



CROSS

New York • Detroit • Chicago

PLUS 45 PIECES PER HOUR DRILLED AND TAPPED

● **AUTOMATIC**—Yes, because the cylinder blocks are transferred from station to station, and drilled and tapped without any attention from the operator.

● **PLUS**—because, in addition, feeding, locating, clamping and ejection of the work are accomplished automatically at the push of a button.

CROSS ENGINEERS designed and built this *special machine* to drill and tap five angular holes in a Diesel engine cylinder block. The results typify the principle behind every Cross *Special Machine*—high-speed, automatic removal of metal on equipment anyone can operate.

In this case, 45 blocks per hour are drilled and tapped at 80% efficiency, the work being moved from station to station and machined without any attention from the operator. But more than that, the work is fed, clamped, unclamped and ejected automatically, too. All motions are mechanically and hydraulically actuated, electrically synchronized and controlled. Inexperienced or unskilled operators maintain accurate tolerances and obtain large-volume production from a machine that occupies comparatively little floor space.

Thus Cross engineering produces a *special machine* to combine difficult drilling and tapping operations and perform them at high speed at the push of a button—a principle Cross can apply to your many metal-removing problems.

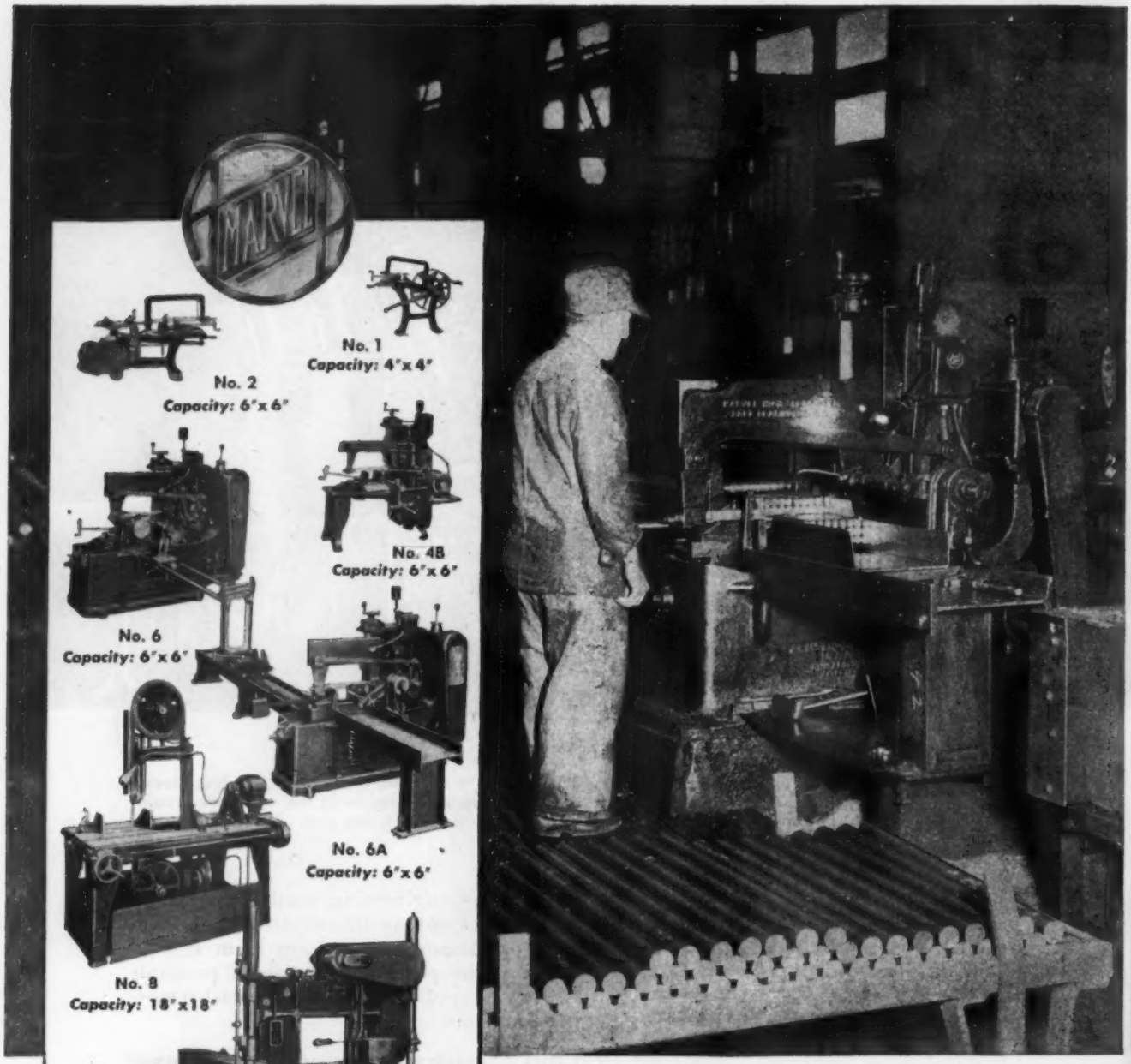
Cross Engineers are prepared to help lower your costs and assist with your manpower difficulties by designing, building and installing special machinery in your factory and showing your workmen how to operate it.

A new Cross Catalog contains 35 detailed case histories of successful Cross *Special Machines.* For your copy, write on your letterhead to The Cross Company, Detroit 7, Michigan, Department 31.

Special Machines •

for automatically performing any one or a combination of metal cutting operations

TURNING · MILLING · DRILLING · BORING · REAMING · TAPPING · GRINDING



This MARVEL 9A Production Saw paid its cost in 30 days

There's none of the old fashioned, tedious, plugging-along type of hack sawing at the Shop of the I. C. Railway because they do their cutting-off with a high speed MARVEL No. 9A Production Saw—the same MARVEL Saw used to cut-off astronomical numbers of rifle and machine gun barrels.

Built for continuous heavy-duty operation, this really fast, all-ball-bearing saw automatically feeds, measures and cuts-off single or nested bars with no more operator attention than an automatic screw machine. On the job illustrated above, six hours after forty 18' x 1" steel bars were laid on the saw's feed rack, they had been cut into 840 accurate, 10-inch lengths, for staybolts. Equally efficient on both production runs and miscellaneous cuts, this saw "paid for itself in the first thirty days of operation".

Write for new Catalog

ARMSTRONG - BLUM MFG. CO.

5700 Bloomingdale Avenue **Chicago 39, U.S.A.**

Eastern Sales Office: 225 Lafayette St., New York 12, N. Y.

Union Cutters (as well as the famous Union Twist Drills, Reamers, and other popular cutting tools) are accepted nationwide for their accuracy in war production. In fact, their long-lasting qualities assure efficiency, even when used by inexperienced operators. Put Union Cutters to work . . . with proper care, they'll deliver the long term service and dependability so essential under today's severe conditions of constant use. Choose Union — the Tools you buy again!

UNION

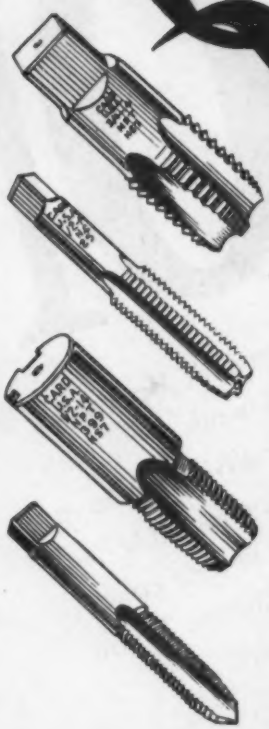
-the Tools you buy again!

Union Twist Drill Co.
Athol, Mass.

S.W.Card
Butterfield
UNION

DIVISIONS OF THE UNION TWIST DRILL COMPANY

CARD means Quality



Card Taps are superior taps; they unfailingly meet the exacting demands for speed and high quality workmanship in war production. Their superiority is the result of a generation of research, experience and advanced metallurgical knowledge. When you need precision Taps . . . when you want accuracy, durability, toughness, remember – "CARD" means "QUALITY"!

S.W.Card
Butterfield
UNION

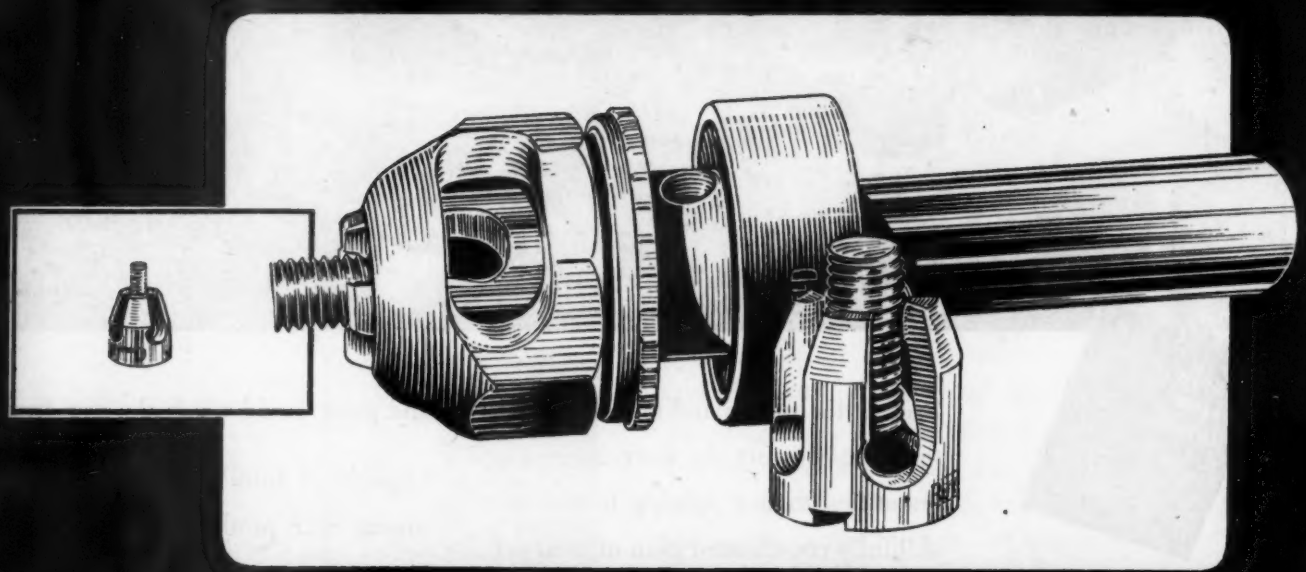
S. W. Card Mfg. Co.

Mansfield, Mass.

DIVISIONS OF THE UNION

ANY SIZE IN

Butterfield features a complete line of standard sizes of THRED-RITE Adjustable Collet Dies and Holders, in carbon steel and high speed steel, for NC and NF Threads, for assured results with comparatively inexperienced operators. Simply assemble die on die seat lugs with test stud in place, screw on adjusting cap. Graduated micrometer lock nut . . precise centering due to full floating construction . . economical . . effortless . . fast . . accurate!

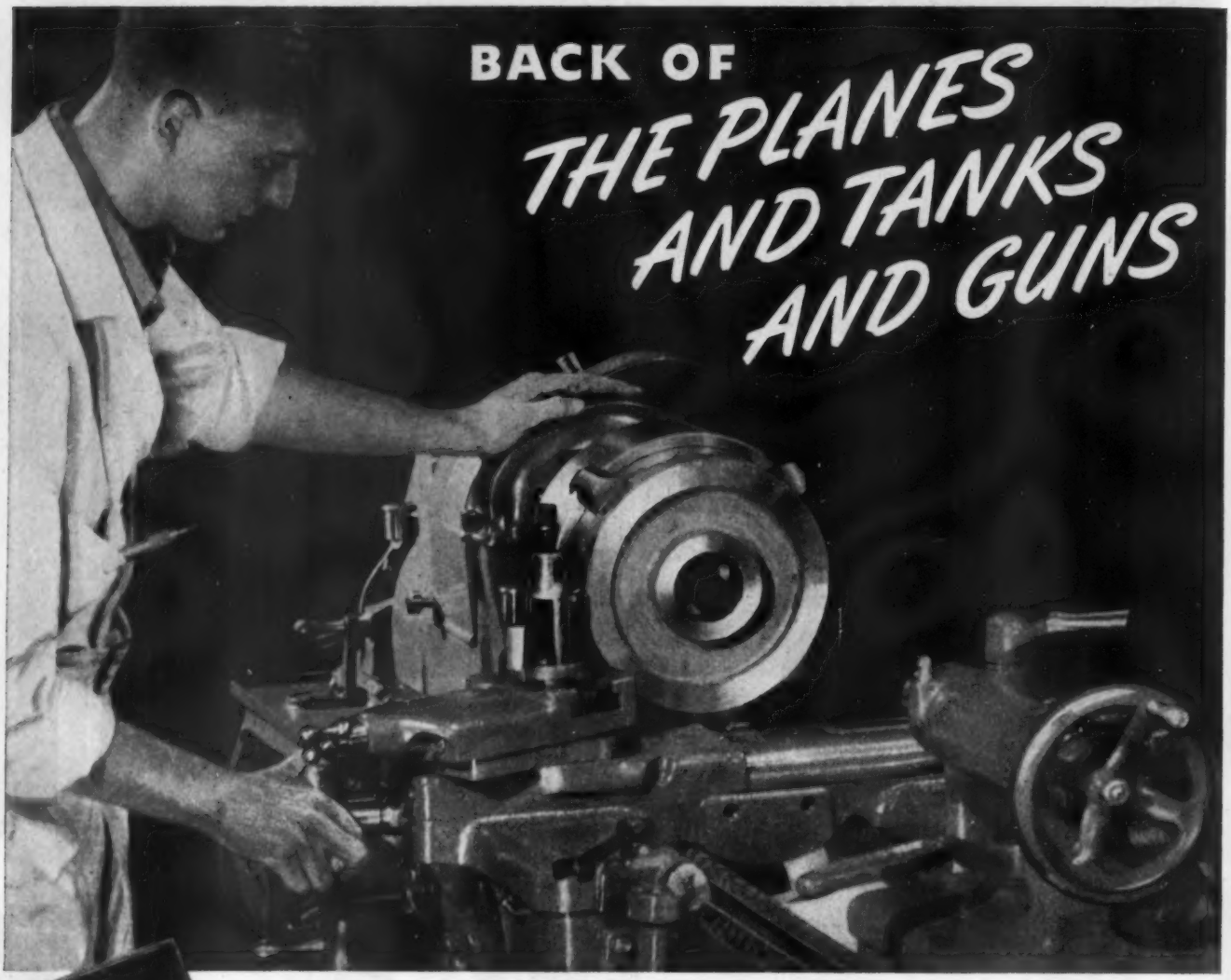


Butterfield Division

Derby Line, Vt. *Rock Island, Que.*

S.W.Card
Butterfield
UNION

TWIST DRILL COMPANY



All of the South Bend Toolroom Lathes, Engine Lathes and Turret Lathes are described in Catalog 100C. Write for a copy of this new, 48-page catalog.

Buy War Bonds!

Army-Navy Production Award With Two Stars

Back of the planes and tanks and guns that are flowing in ever-increasing quantities to our fighting forces is a skillfully coordinated plan of men and machines — a combination of skill, ingenuity and mechanical perfection that is going to win.

Accuracy is the key to the success of this great plan. Without the split-thousandth tolerances that assure perfect interchangeability of parts, the production goals could not be attained —and not enough planes and tanks and guns would reach the war fronts.

Capable of fulfilling the demands of urgent war production, South Bend Lathes have the accuracy and speed for the most exacting precision operations, plus ruggedness and power for efficient service.

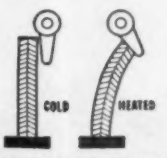
South Bend Lathes are made with 9″, 10″, 13″, 14½″, and 16″ swings in both Quick Change Gear and Toolroom models. Practical attachments are available for special classes of work.

SOUTH BEND LATHE WORKS

SOUTH BEND 22, INDIANA

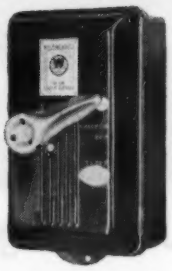
LATHE BUILDERS FOR 37 YEARS

Wild arcs tamed *Quick!*



CALLING THE TRICK is the job of this Westinghouse Bi-metal Element. Two metals which react differently to heat are bonded together. Threatening overloads cause the Bi-metal to bend, tripping the interrupting mechanism and opening the circuit—*before* any damage is done.

TAMING THE ARC is the job of the "De-ion" arc quencher. It consists of parallel metal plates in the form of a grid. The arc is drawn into the quenching chamber . . . divided into segments . . . smothered between the plates—in the space of a half cycle.



When current's on the rampage, a circuit breaker has to function *fast* and *sure*—every time!

Westinghouse "De-ion" Circuit Breakers are built for just such hair-trigger protective action. They pass harmless overloads without interruption, but let danger threaten, and quicker than a blink of the eye—the circuit's opened . . . the arc is quenched. Burns and pits are minimized; contacts stay cleaner, last longer.

Once the disturbance is cleared, service is instantly restored by a flip of the indicating handle. No waiting—no repairs—no parts to replace.

Protect equipment and circuits with Westinghouse "De-ion" Circuit Breakers. Ratings up to 600 amperes; enclosures for nearly every type of service. Call your Westinghouse Representative today. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., Dept. 7-N.

J-21298

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

"DE-ION" CIRCUIT BREAKERS

How "Cutting Time"

(Right) Milling cutter with inserted blades set to negative-rake and negative-helix angles being used on a G. & L. Horizontal Boring, Drilling and Milling Machine.

...with

G. & L. Horizontal Boring Machine Using Negative Rake Milling Cutter

Yes, you can use negative rake milling cutters on your G. & L. Horizontal Boring Machine. The speeds are there, the feeds are there and the rigidity is there. On work having large surfaces to be milled, you can use negative rake milling to advantage in lowering floor-to-floor time. When parts take a lot of time to set up, and require a great deal of boring and little milling, the use of negative rake cutters contributes less to the total floor-to-floor savings.

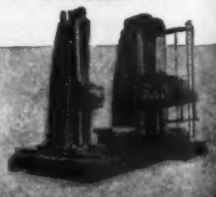
Generally, strict attention is paid to lowering set-up and handling time on horizontal boring machines. However, the additional savings available in the proper selection of tools should not be overlooked. This example of negative rake milling on a G. & L. is presented as but one way that this new cutting method can be applied to this machine. Perhaps the nature of your work will permit equal or better savings through the use of negative rake cutters.

G&L

GIDDINGS & LEWIS

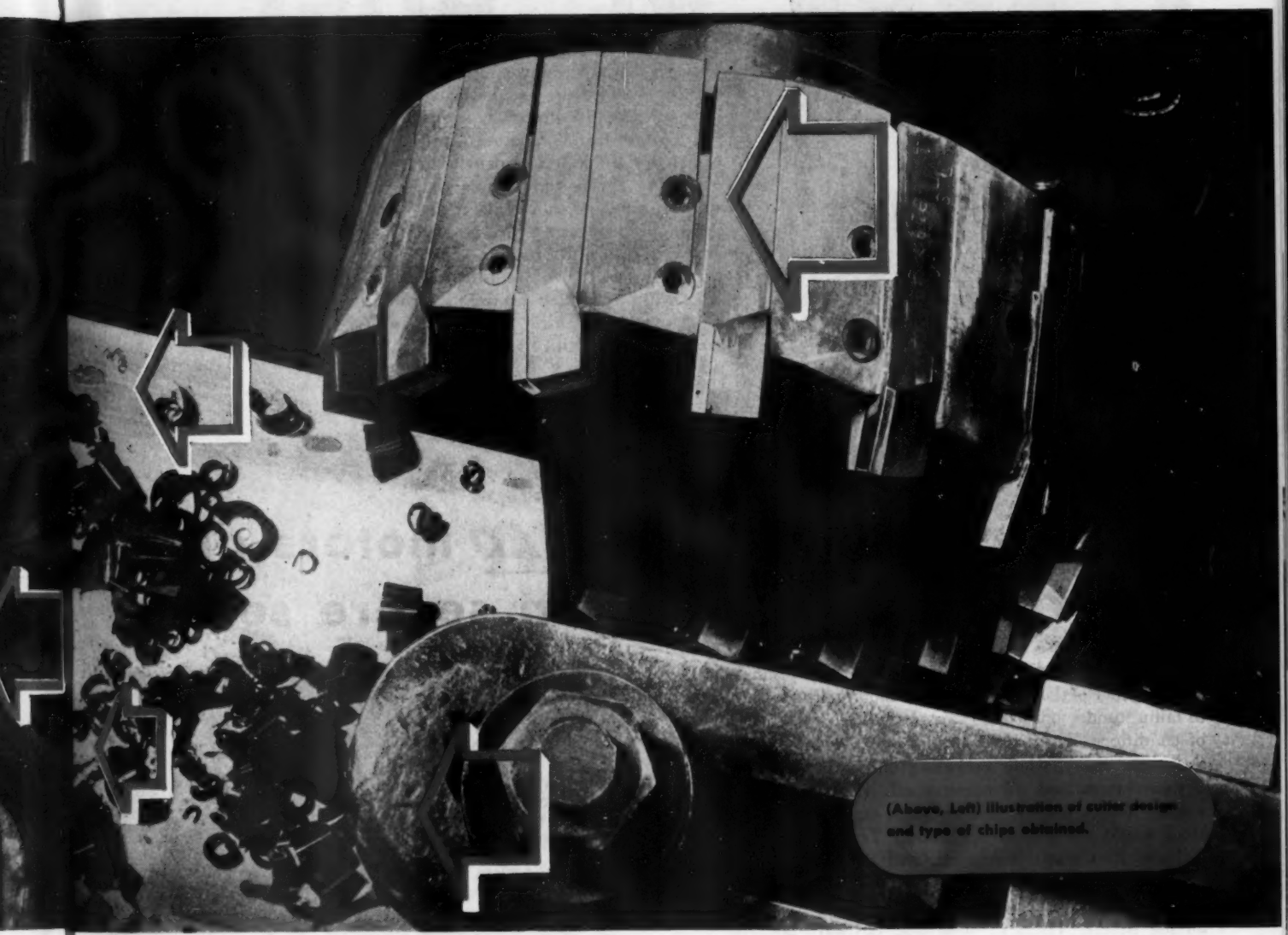
138 DOTY STREET

Right: G. & L. Table Type Machine.



Right: G. & L. Floor Type Machine.

"Was Reduced . . .



(Above, Left) Illustration of cutter design and type of chips obtained.

DETAILS OF JOB

Part—Connecting rod for reciprocating steam engine.

Machine—G. & L. Horizontal Boring, Drilling and Milling Machine.

Cutter — Ten-inch diameter face milling cutter with fifteen inserted T. C. tipped blades.

Depth of Cut—3/8".

Cutter Speed—220 R.P.M. (570'/min. approx.).

Feed per Tooth—.004".

Material—S.A.E. 1030 steel.

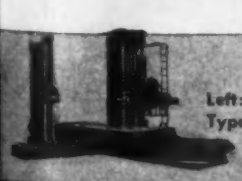
Cutting Time—2 minutes.

Former Time — 30 minutes with 5" diameter high speed steel cutter.

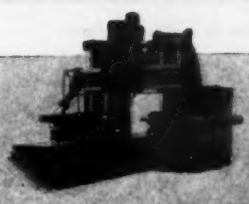
Savings—28 minutes.

MACHINE TOOL CO.

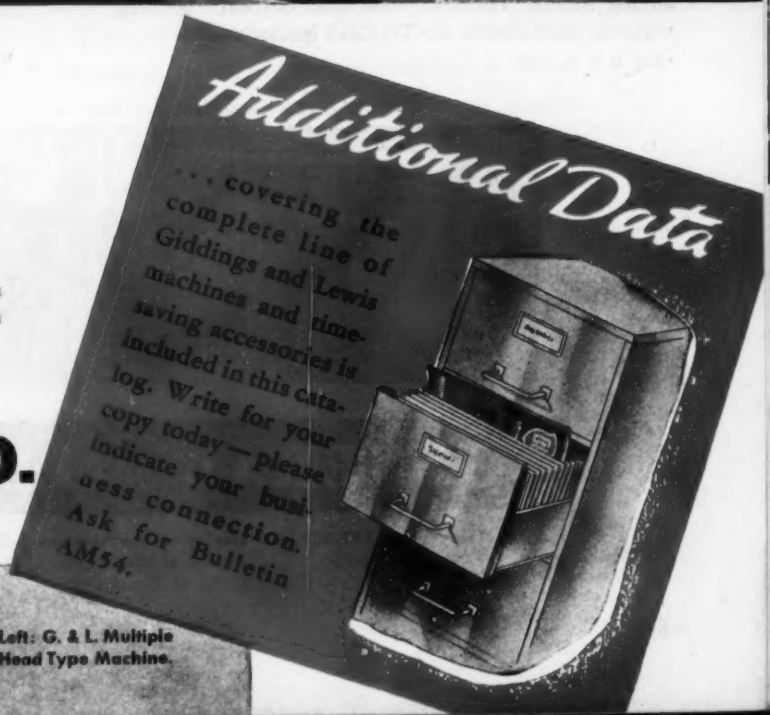
FOND DU LAC, WIS.



Left: G. & L. Planer Type Machine.



Left: G. & L. Multiple Head Type Machine.


Additional Data
. . . covering the complete line of Giddings and Lewis machines and time-saving accessories is included in this catalog. Write for your copy today — please indicate your business connection. Ask for Bulletin AM54.

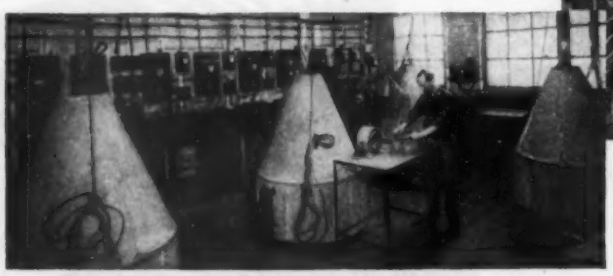
DOSE OF SALT

Encrusted with chemical salts, this Tri-Clad motor continues to drive a pump without breakdown of its insulation. In almost every industrial plant, motors are called upon to keep going under conditions which try their endurance to the limit. It may be in a plating room, or on an exhaust fan, or in a wet sub-cellar, or — as in this case — in connection with chemical processing. In emergencies, open motors may face conditions for which good engineering practice would require totally enclosed construction — conditions which tend to corrode the frame and attack the insulation. Endurance of Tri-Clad motors under such conditions results from tests like the one described below.

Salt-spray test of TRI CLAD motors gives assurance of long life in severe service

IN this accelerated life test to determine the ultimate endurance of their insulation, the motors are operated to failure under one of the worst possible combinations of conditions. They are continually exposed to a 2% salt-water spray, while operating on a duty cycle of 3 minutes on and 37 minutes off. (These repeated voltage surges impose greater stress on the insulation than would continuous operation.) Tests are run on all new insulations developed, and as a production check on motors taken at random off the assembly lines. Because of their endurance under this severe test, among others, Formex* wire and Glyptal* bonding material were chosen for Tri-Clad insulation.

*Reg. U. S. Pat. Off.



Left: Conical hoods cover the tanks in which these salt-spray tests are conducted.

GENERAL ELECTRIC

Every week 192,000 G-E employees purchase more than a million dollars' worth of War Bonds.

FORGED
for soundness
MAGNESIUM
for light weight

Typical of many wartime products of American Magnesium Corporation is this forging, machined as you see it here into a part for an automatic pilot. It is very light in weight, magnesium's outstanding characteristic. It is sound, because it's a Mazlo forging. It provides excellent machinability, a property of all magnesium alloys.

Magnesium forgings enable you to achieve the ultimate in lightness with safety, because of their high strength-weight ratio. Many a warplane carries evidence of the dependability of these magnesium products.

In addition to forgings, ranging in size from tiny pieces to those weighing many pounds, American Magnesium is producing magnesium alloy products in all other forms; sand castings, permanent mold and die castings, screw machine products, shapes and sheet. More than twenty years of experience in fabricating magnesium goes into these dependable products.

If you are wondering about ways of utilizing the weight-saving ability of magnesium alloys to best advantage, our engineers will gladly assist you. Write Aluminum Company of America, Sales Agent for Mazlo Magnesium Products, 1709 Gulf Bldg., Pittsburgh 19, Pa.

MAGNESIUM MAZLO PRODUCTS

AMERICAN MAGNESIUM CORPORATION

SUBSIDIARY OF ALUMINUM COMPANY OF AMERICA

then he said to himself

"I hope they don't ask me HOW!"

Pierre Laval, on being handed the mouthpiece by Adolf, promptly broadcast to the French people:

> "In the New Europe, it is socialism that will be installed . . . In the New Cities, labor will be protected, honored and magnified, as well as those spiritual and moral values that may blossom there."

Just like that he solved France's problems of postwar.

Of course, we all smile derisively as we think how promptly after that, labor was pushed into railway cars and whisked into forced production in other lands.

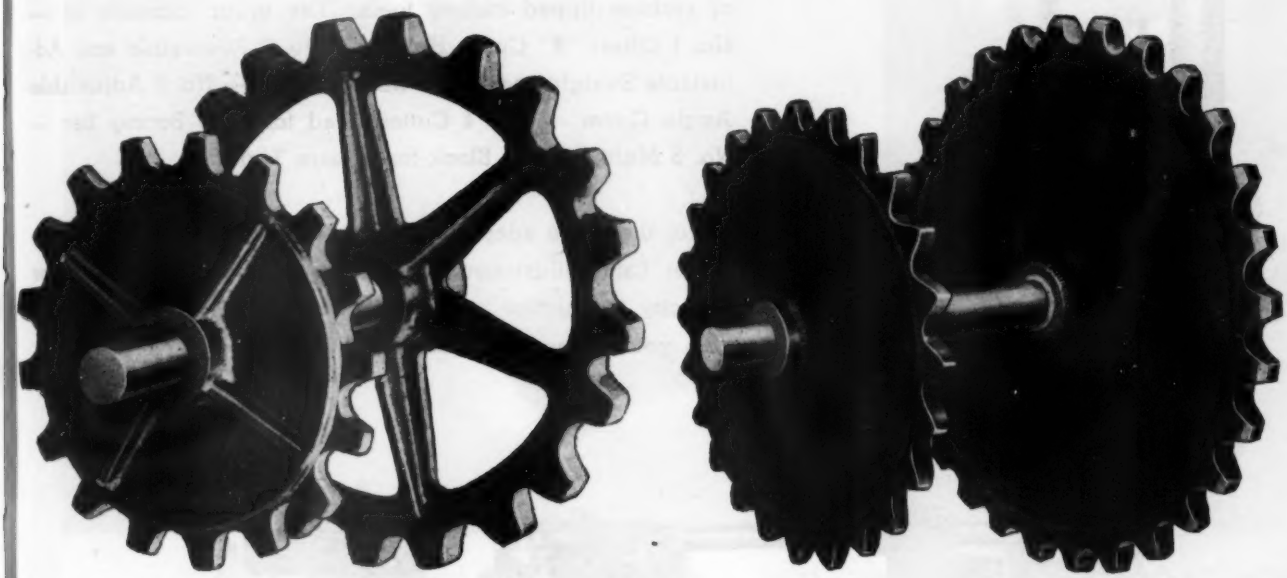
And we smirk as we contemplate the "spiritual and moral values" that have blossomed since.

But here at home, we accept as gospel the glorious promises of our social planners for oodles of streamlined super-products the people will get for a song.

Rarely do we ask, "BUT HOW!!"

"Protected, Honored and Magnified"—*he says*

Look, Pierre, under your own or any *new social order,* a small group of soft-handed *theorists* like yourself could never give a *practical* answer to the challenge: "BUT HOW?" Yet under an old American *free enterprise* system . . . where protection, honor and magnification are in every man's grasp—workmen down in most metal working plants can themselves answer: *HERE'S HOW!!* (How to get MORE products. — How to get BETTER products. — How to get products AT LOWER COST—so that more people can afford to buy).



HOW to Produce Better Machine Parts at Lower Cost

THESE trenching machine sprockets of welded design (on right) cost $21.55 (large one) and $13.25 (small one). Costs for the former designs (on left) were about 30% higher. Weight has been cut a like amount. By *recourse to arc welding,* engineers are making similar savings and improvements for part after part of the machine.

The design and manufacture of this and other parts of this machine are discussed in a new series of Lincoln Studies.

Free on request to engineers, designers and production supervisors.

How It Is Built

Rim is rolled hot, welded with double V-butt joint and teeth are flame-cut. Web consists of two flame-cut, dished plates. Hub is bar stock.

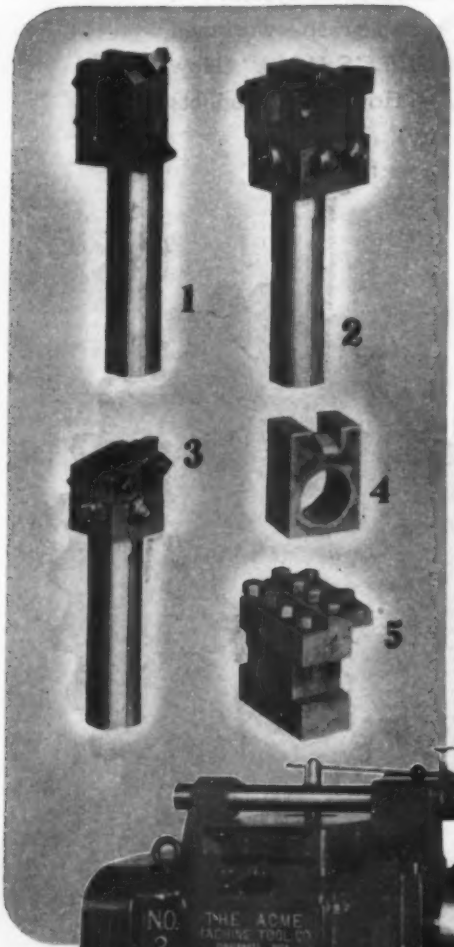
THE LINCOLN ELECTRIC COMPANY • CLEVELAND 1, OHIO

America's greatest natural **recourse**

ARC WELDING

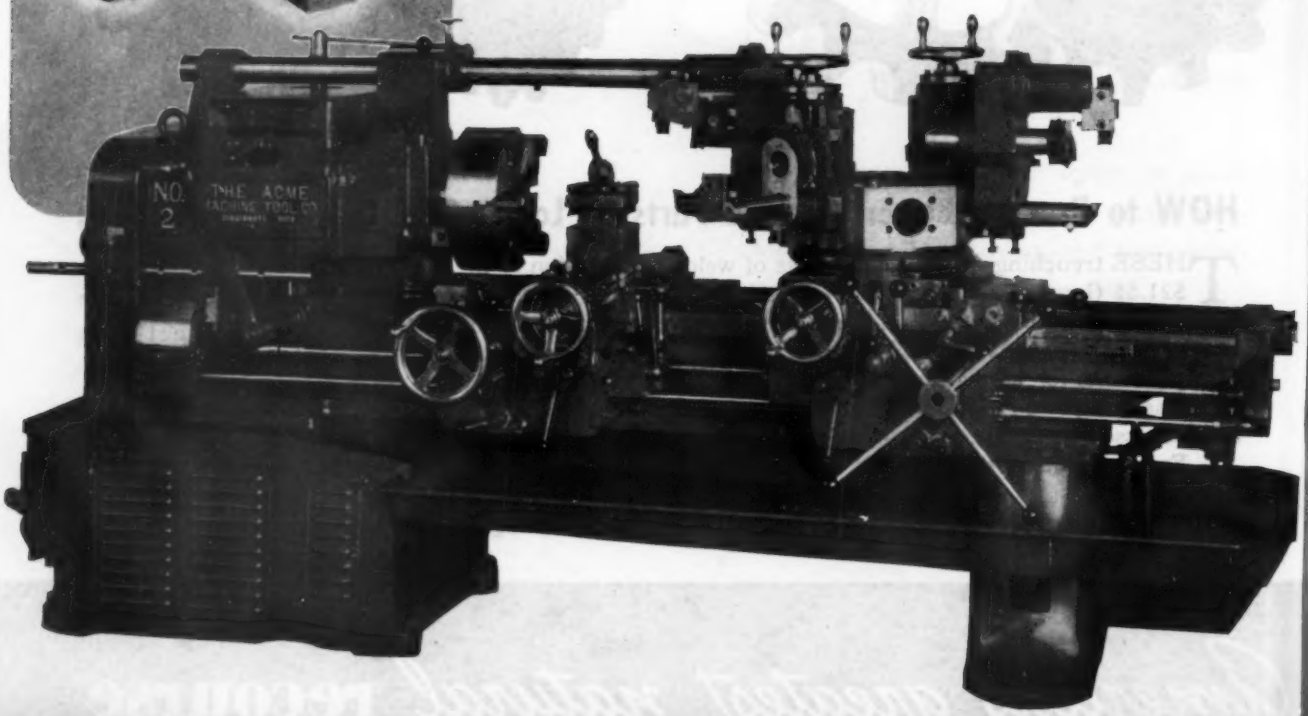
Heavy Duty Tools for Capacity Production

Cincinnati **ACME** Turret Lathes



● One of the main production factors of a turret lathe lies in the heavy duty tools it is capable of handling. This Cincinnati Acme Universal Turret Lathe is designed and built to accommodate the heavy duty tools required today. The group shown is typical of the heavy duty cutter holders needed to obtain the high speeds and heavy feeds demanded of carbide tipped cutting tools. The group consists of — No. 1 Offset "X" Cutter Holder — No. 2 Reversible and Adjustable Straight and Angle Cutter Holder — No. 3 Adjustable Angle Cutter — No. 4 Cutter Head for Stub Boring Bar — No. 5 Multiple Tool Block for Square Turret.

All of these are adaptable to use on the 1-S and 2-S Acme Turret Lathe illustrated. Use these Heavy Duty Tools for capacity production — consistent accuracy — lower costs from your Acme Universal Turret Lathes.



...The ACME MACHINE TOOL CO.
... CINCINNATI 32, OHIO.

Seven speeds forward and three reverse, or the usual three-and-one? Whichever you're designing, here's a potent thought, that transmission housing can be made considerably lighter in weight if you use Alcoa Aluminum Alloys.

There's nothing experimental about this idea. Before the war sidetracked all of the aluminum for materials for war, weight-conscious builders were making transmission housings of aluminum. Sizable savings were effected, increasing pay loads accordingly. These aluminum housings are on the road today, continuing to prove their soundness.

These parts can be machined and assembled in regular production lines with heavy metal housings; no need to change production speeds and schedules. Cast-in inserts make that possible.

Manufacturers who have become familiar with the weightsaving possibilities of aluminum will see other opportunities for extending this principle. Alcoa engineers will gladly assist in this work. ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA
ALUMINUM
REG. T.M.

ALCOA
ALUMINUM

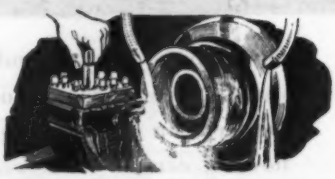
KEEP PRODUCTION *Up* AND INVENTORY *Down*

use TECO *Cemented Carbide!*

War requirements stress the need for peak production; changes in production emphasize the need for low inventories. You accomplish *both* by using TECO Cemented Carbide for turning, boring and facing operations. Each tool stays on the job much longer, produces more pieces, needs fewer replacements. Thus, you raise your production to higher levels, while maintaining low tool inventories.

TECO Cemented Carbide has resistance to wear and breakage in an advanced degree, through controlled hardness, density and uniformity of structure. Comparative job records consistently show sharp increases in production per tool when TECO Cemented Carbide is used—a fact you can prove on your own machines. Write for catalog and new price list covering tools and blanks in a wide range of grades, styles and sizes.

CUT *MORE* STOCK HERE



CARRY *LESS* STOCK HERE

TUNGSTEN ELECTRIC CORPORATION, 568 39th Street, Union City, N.J.
Representative: Architects & Builders Bldg., Indianapolis, Ind.
Branch Office: 2906 Euclid Avenue, Cleveland, Ohio

TECO *Pioneers in Tungsten Carbides for over a Quarter Century* **CEMENTED CARBIDE**

THOMPSON GRINDERS

Dependable Precision Grinding

● The machine shown at Douglas Aircraft Co. is typical of the hundreds of Thompson Grinders now operating in Aircraft and allied parts plants meeting rigid tolerances — high production demands — and exceptional finish requirements.

The Thompson Grinder is easy to operate — all controls are at the operator's finger tips — it responds instantly to operator's touch — and the smooth shockless hydraulic table drive provides a remarkably smooth finish on all work.

There's a Thompson Grinder in a type and size to handle most any grinding job — from the Tool Room type with a 6" x 18" capacity up to the largest "C" type — 36" x 36" x 240".

THE **Thompson** GRINDER CO.

SPRINGFIELD, OHIO

ARMSTRONG

Your ARMSTRONG TOOL HOLDERS *can take the pressure*

The tremendous pressure being applied to increase war production, carried down the line is resulting in the use of higher cutting speed and heavier feeds on machine tools.

The actual physical pressures developed at the cutting point on lathes and other machine tools are computed to reach as high as 250,000 lbs. per square inch—yet wherever the correct ARMSTRONG TOOL HOLDER is used it has strength to stand up year after year on any lathe, planer or shaper operated at full capacity. ARMSTRONG TOOL HOLDERS make practical cutting speeds often double the "standard" cutting speeds generally applied.

If you are being pressed for greater production, use the correct ARMSTRONG TOOL HOLDER for every operation and step up speeds and feeds.

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
315 N. Francisco Ave., Chicago 12, U.S.A.

Eastern Sales Office:
199 Lafayette St., N.Y.

Buy ARMSTRONG TOOLS from your Supply House

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

HARDINGE

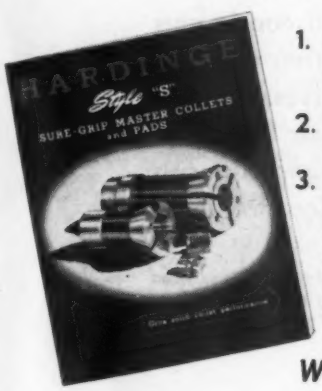
Style "S"
SURE-GRIP
MASTER COLLETS and PADS

Available for Cleveland, Cone, Greenlee, Gridley and Acme-Gridley, National Acme and New Britain Automatics taking draw-in style collets with a capacity of 1" or more. Pads interchange between machines of similar capacity

Give solid collet performance

Solid collet performance with Hardinge Style "S" exists simply because the head angle of the master collet and the gripping surfaces of the pads are the same as solid collets. There are no holes in the head angle nor tapped holes in the collet pads. There is an independent lock to anchor each pad section in place.

FEATURES



1. **Permits size change without removing collets from the machine spindle.**
2. **Final tightening possible for pads when closed on bar stock.**
3. **Greater accuracy. This feature is due to the fact that pads can be ground accurately on an arbor. The greater accuracy with hexagon or square pads will particularly help you in production.**
4. **Master Collet design affords maximum strength.**
5. **Lower cost – make comparisons in price and performance and you will soon standardize on Hardinge Style "S".**
6. **Lower inventory possible. Pads are interchangeable between different makes of automatics employing draw-in style collets with similar capacity.**

Write for this latest bulletin.

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE ELMIRA, N.Y.

A Key to BETTER MAINTENANCE

Day and night operation, excessive wear, and today's replacements difficulties demand *better maintenance* of equipment.

A key to better maintenance is *better lubrication.*

In addition to a complete line of quality cutting oils for all metal working operations, Sinclair offers a range of specialized oils and greases for better lubrication of *MACHINING EQUIPMENT.*

Sinclair General Purpose Oils permit a reduced inventory of lubricants highly efficient for turret lathes, automatics, broachers, shapers, grinders and machine tools generally.

Where top loads and continuous operation threaten shorter life for motors, mechanical drives, and all types of bearings, Sinclair lubricants make for *better maintenance.* Consult us about your lubrication problems.

(Write for "The Service Factor" — published periodically and devoted to the solution of lubricating problems.)

SINCLAIR INDUSTRIAL OILS

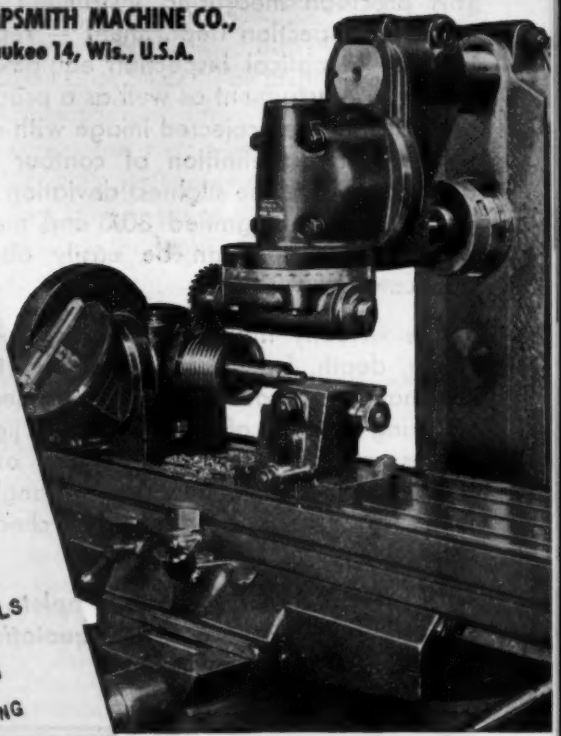
FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE SINCLAIR REFINING COMPANY (INC.), 630 FIFTH AVENUE, NEW YORK 20, N. Y.

Helping Uncle Sam Sink Enemy Subs

Kempsmith Millers in Service on U. S. "FLAT TOPS" . . .

For 56 years, Kempsmith has been a world-wide by-word for America's supremacy in milling machines and a creditable factor in advancing the American way of life. Today, with our country at War, Kempsmith is doing its duty, both on the production front and on the fighting front. Rugged Kempsmith milling machines are being used in the manufacture of essential war equipment. And on the far-off fighting fronts, sturdy Kempsmith machines are maintaining and repairing this equipment. The Kempsmith Miller serving on the Carrier "U. S. S. Card" is a typical example. Kempsmith is proud of the citation shown below, and anxious to continue in the service of our nation.

The KEMPSMITH MACHINE CO.,
Milwaukee 14, Wis., U.S.A.



BY DIRECT WIRE FROM
WESTERN UNION

NEWCOMB CARLTON, Chairman of the Board — J. C. WILLEVER, First Vice-President — A. N. WILLIAMS, President

SYMBOLS
DL = Day Letter
NT = Overnight Telegram
LC = Deferred Cable
NLT = Cable Night Letter
Ship Radiogram

CLASS OF SERVICE
This is a fullrate Telegram or Cable gram unless its character is indicated by a suitable symbol above or preceding the address.

The filing time shown in the date line on telegrams and day letters is STANDARD TIME at point of origin. Time of receipt is STANDARD TIME at point of destination

LONG WU W49 NL=
CT WASHINGTON DC DEC 18=
TO THE MEN AND WOMEN OF KEMPSMITH MACHINE CO=

THE EXCELLENT PERFORMANCE OF A KEMPSMITH MILLING MACHINE IS CITED IN A REPORT FROM THE "USS CARD". THE "BABY FLAT-TOP" WHICH TOGETHER WITH HER ESCORT SHIPS WAS RECENTLY AWARDED A PRESIDENTIAL UNIT CITATION FOR SINKING MORE ENEMY SUBMARINES THAN ANY SIMILAR GROUP IN NAVAL HISTORY. THE REPORT STATES: "THE MACHINE SHOP IS ONE OF THE BUSIEST SPOTS ON THE CARRIER. TOOLS ARE IN CONSTANT USE REPAIRING BOTH SHIP AND PLANE EQUIPMENT. THATS WHY WE ARE GLAD TO HAVE THE BEST." YOU ARE TO BE CONGRATULATED FOR PROVIDING OUR FIGHTING MEN WITH SUCH RELIABLE MACHINE TOOLS.=

W B YOUNG REAR ADMIRAL (SC) USN
CHIEF OF THE BUREAU OF SUPPLIES & ACCOUNT
USS CARD USN. DEC 20 1943 846A.

Thread milling a worm, using a Kempsmith Type "G" machine equipped with Hi-Speed Attachment, dividing head and spiral cutting mechanism.

KEMPSMITH

• Precision Built Milling Machines Since 1888 •

The Toolmakers Microscope

. . . makes microscopic precision measuring almost as easy as the use of a simple gage . . . BUT VASTLY MORE ACCURATE ! !

This precision measuring instrument — for tool room or inspection department — represents the ultimate in optical inspection equipment. It is a laboratory instrument as well as a production tool, reproducing the projected image with a degree of clearness and definition of contour that immediately discloses the slightest deviation from standard. Work is magnified 30X and measurements within 1/10,000" can be easily obtained and duplicated.

While virtually indispensable for checking form, angle, depth, lead and diameter of threads, the Toolmaker's Microscope is ideal for measuring and checking all kinds of form tools, drill jigs, templets, gages, machine parts and many other similar things. It may also be used for angle measurements and for work difficult to check by usual methods.

Write for bulletin giving complete detailed specifications. Ask for quotation.

QUICKLY DETECTS THREAD ERRORS LIKE THESE!

Lead error — resulting in bearing at only every fourth thread.

Threads too sharp at minor diameter — resulting in possibility of easily broken screws.

Screw with lead error — resulting in the necessity for its being smaller in order to enter standard size threaded hole.

Thread at wrong angle to axis resulting in very little contact.

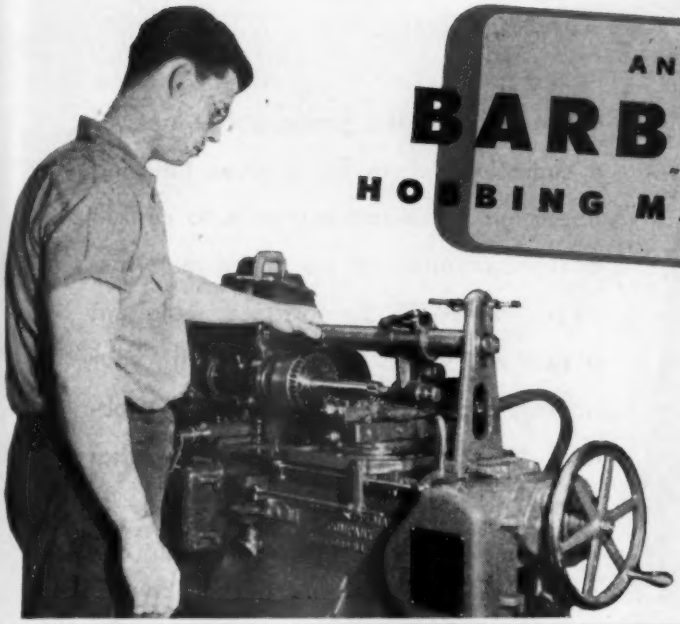
Incorrect angles of threads — resulting in deceptive pitch diameter measurements.

Threads bearing at root only — another reason for very little contact.

GEORGE SCHERR CO.

INCORPORATED

124 LAFAYETTE STREET NEW YORK 13, N. Y.



ANOTHER EXAMPLE OF

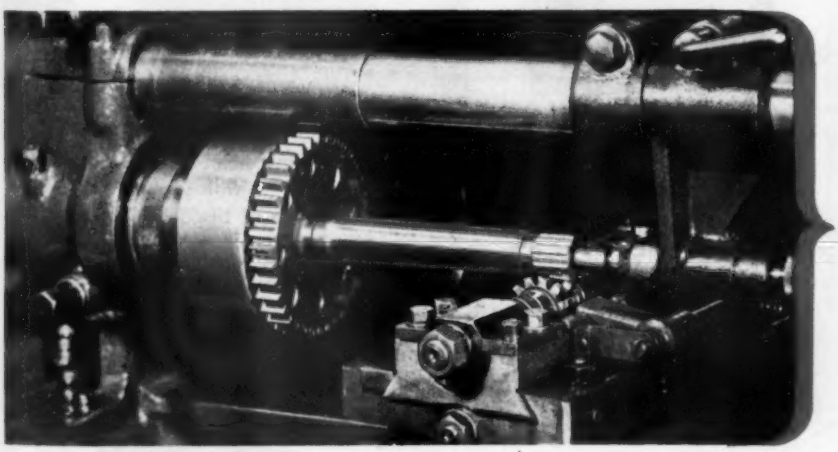
BARBER-COLMAN HOBBING MACHINE PERFORMANCE

No. 3 HOBBING MACHINE

The machine used on this job is a standard Barber-Colman No. 3 Hobbing Machine — a general purpose machine of consistent accuracy for small or large lots of spur or helical gears, splines, and other hobbed forms. On this job the operator has added two indicators, one on the upright and one on the overarm support, to help in checking absolute parallelism on the finish cut.

ACCURATE SPLINES *for* STARTER GEAR

The operation shown here is hobbing splines on one end of an aircraft Starter Gear Shaft. The material of the shaft is SAE 6155 with a hardness of 250-275 Brinell. *Good finish is required, tooth thickness of each key must be held within .002", and maximum allowable runout is also .002".* Two cuts are taken, first a roughing cut, followed by resetting for depth and a finishing cut. The six keys are .970" long with an outside diameter of 1.165".



40 per 10 hr. SHIFT

Set-up and hob data for this job are;

Feed per rev. of work, roughing..... .015"
Feed per rev. of work, finishing..... .018"
Hob speed.....157 r.p.m.
Floor-to-floor time.....13 min.
Production, per 10-hr. shift.....40 pieces
Hob....1⅞" O.D. x 1" length x ¾" straight hole, ground, SINGLE POSITION type.
No. of settings..1 only, for single pos. hob.
Pieces per grind.....approx. 20
Spline dimensions.....1.165 "O.D., .986"/.982" R.D. 6 Keys—.249"/.247".

SINGLE-POSITION HOB USED

This job required a sharp root corner (.005"), and called for a single position hob. The distinguishing characteristic of this hob is that it has only one full-formed finishing tooth, all others being graduated, semi-finishing teeth.

BARBER B-C COLMAN PRODUCTS: HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

Barber-Colman Company

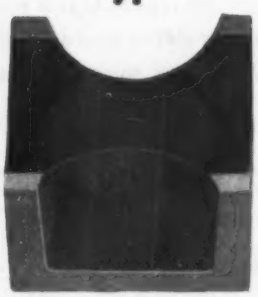
GENERAL OFFICES AND PLANT • 111 LOOMIS STREET • ROCKFORD, ILLINOIS, U. S. A.

How to determine proper hardness OF SUPERFINISH STONES

While selecting the grade or hardness of a superfinish stone for a given finishing operation the wisest course is to consult a representative of the stone manufacturer. MID-WEST, for instance, maintains a staff of experts to help you with your honing, superfinishing or grinding problems. When, as sometimes happens, that is not possible, here's a simple way to determine whether the stone you are using is of the proper hardness:

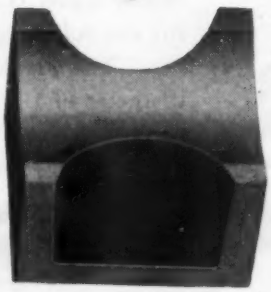
Study These Photographs

A



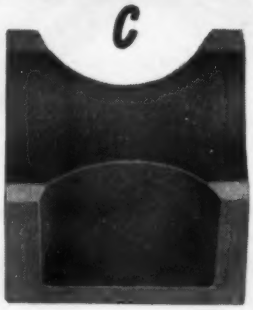
If the stone becomes too black (caused by oxydation of metal on the stone) the stone is *too hard.*

B



If the stone remains too clean, too close to its original color, it is *too soft.*

C



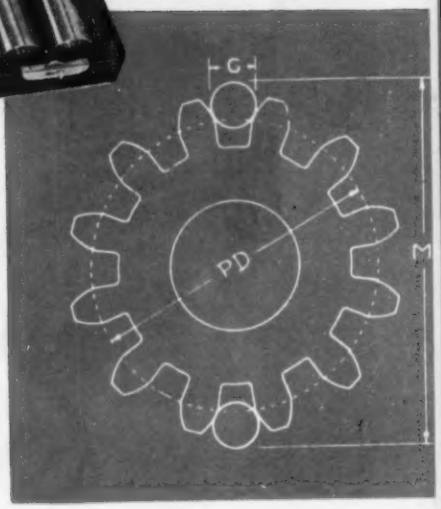
The stone best suited for your job will be a compromise between the two. It will show only a slight discoloration of its cutting surface.

MID-WEST ABRASIVE COMPANY

Manufacturers of DEPENDABLE Abrasives

Owosso, Mich. — 1960 E. Milwaukee Avenue, Detroit 11, Mich. — Rochester, Pa.

Set No. 26 External Gear Measuring Wires for use with new simplified gear measuring system.



SIMPLE, RELIABLE, SUPER-ACCURATE!

Van Keuren GEAR MEASURING SYSTEM

Simple! . . . The only calculation required is one of simple division.
Reliable! . . . The system is based on formulas approved by the American Gear Manufacturers Association.

Super-Accurate! . . . Van Keuren Gear Measuring Wires are accurate to within 25 millionths of an inch for roundness and exact size.

Van Keuren gear measuring tables give the measurements (M) over the wires (G) for 1 diametral pitch gears of correct pitch diameter (PD). The only calculation required is to divide the measurement for 1 diametral pitch by the diametral pitch of the gear being measured. The tables are complete for gears from 10 to 171 teeth and for pressure angles of 14½°, 17½°, 20°, 25° and 30°. The tables provide for measuring both external and internal gears. They are far more accurate than anything previously available. No interpolations are required.

Write for catalog No. 31, giving full details, complete tables and instructions for their use.

Our Catalogue No. 31 is a manual of precision measuring systems, giving complete tables and simplified formulae for measuring all standard threads, splines and spur gears. Send for this valuable handbook.

Ultimate Accuracy

Van Keuren

THE VAN KEUREN CO., 25th YEAR 176 WALTHAM ST., WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles

The score in this war is far, far from conclusive. Production, colossal a year ago, must be greater. More ships, planes, tanks — more of all weapons of war — are needed. Anything can happen. We can still lose. Or win. General Machinery Corporation believes in keeping that guard up . . . and we're making the engines, cannon, machine tools for the finish.

GENERAL MACHINERY CORPORATION

HAMILTON, OHIO

THE NILES TOOL WORKS CO.

THE HOOVEN, OWENS, RENTSCHLER CO.

GENERAL MACHINERY ORDNANCE CORPORATION

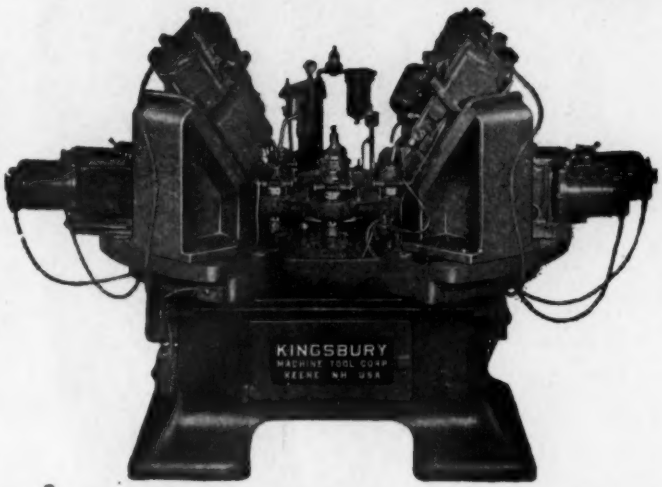
FLEXIMATIC

Demonstrates its Speed and Accuracy on Fuse Part Production

Drilling, counterboring and tapping brass fuse part components—doing the entire job in a single chucking of the work—producing 500 completed parts per hour! Jobs like this, that demonstrate FLEXIMATIC speed, simplicity and accuracy, are the reason why FLEXIMATICS are so widely chosen for intricate operations on munitions parts.

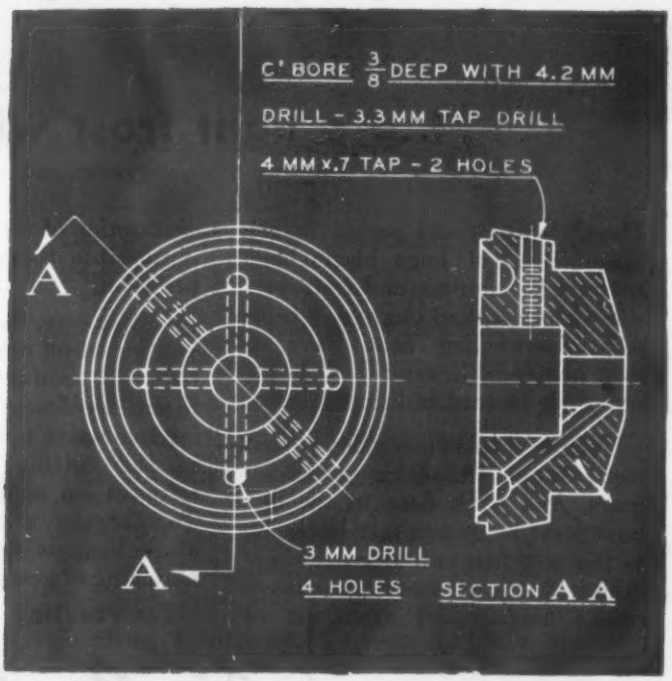
Kingsbury FLEXIMATICS are made up of standard units mounted on one of several types of standard bases. This method greatly lowers the cost of special machine construction and, in addition, permits changes to be readily made to meet changes in production. In the FLEXIMATIC illustrated, individual work holding fixtures in the turret are automatically indexed during the indexing of the main turret, thus presenting the part in various positions at the work stations so that all the operations are performed in a single chucking.

To meet the exacting standards of accuracy and the imperative need for speed in munitions production, choose FLEXIMATICS by Kingsbury!



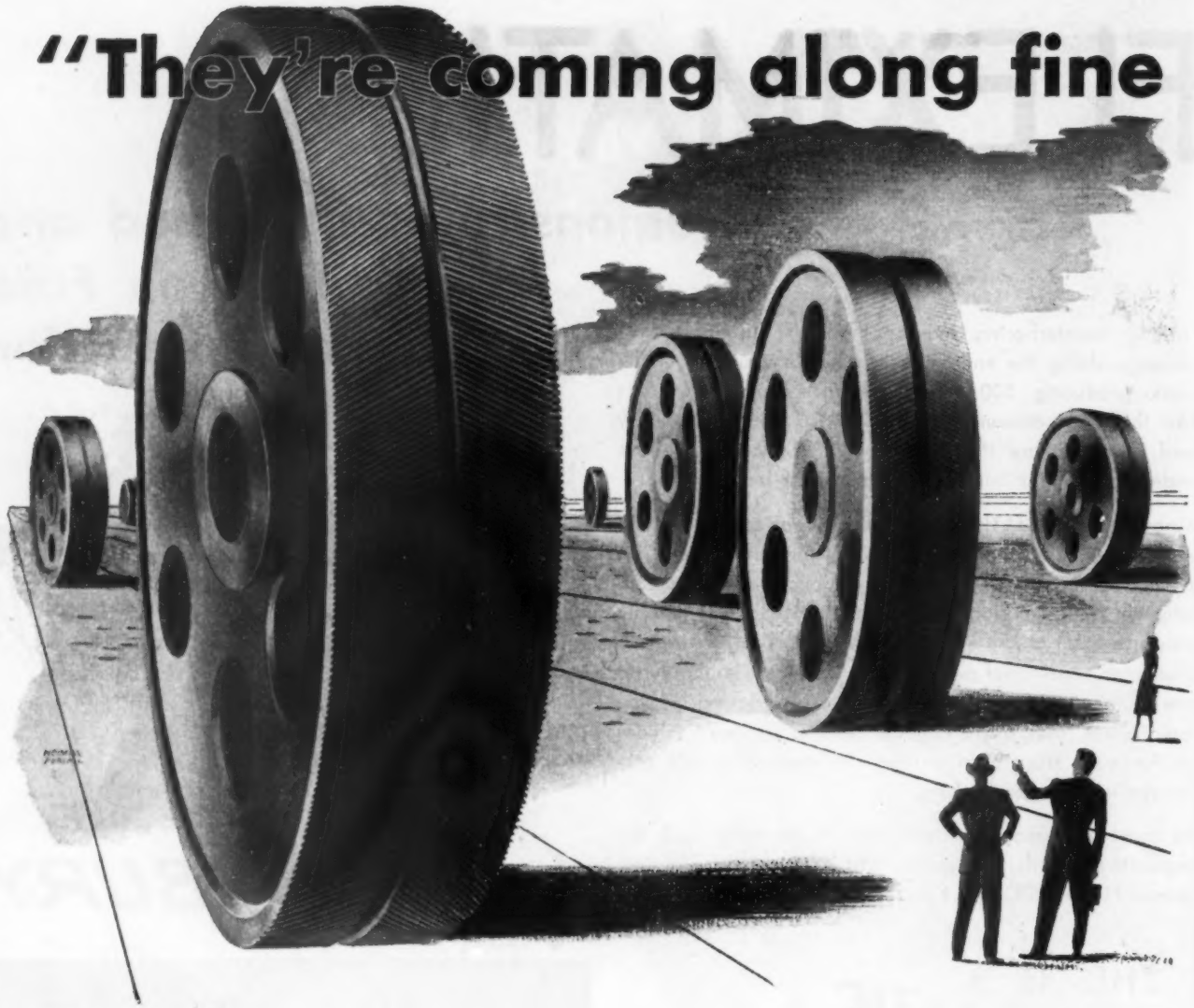
by KINGSBURY

THIS IS A FLEXIMATIC MUNITIONS JOB!



KINGSBURY MACHINE TOOL CORPORATION
KEENE NEW HAMPSHIRE U S A

"They're coming along fine



. . . but a light frost would ruin the whole crop!"

There's one critical period in the manufacture of huge herringbone gears for U.S. cruisers and destroyers when any marked change in temperature—whether heat wave or light frost—might send them to the scrap pile instead of into the fight.

You see, it takes many days to cut teeth for one of these big propulsion gears. And work done in the last hour must be as accurate in results as the very first cut. If, somewhere in the process, a temperature change causes uncontrolled expansion or contraction of the metal, it becomes impossible to maintain uniform precision.

In this case, G-E *air conditioning* and *industrial refrigeration* team up to keep production humming—regardless of weather. Air conditioning maintains uniform temperature in the cutting room. Industrial refrigeration cools the cutting oil. Together they eliminate the temperature hazards and permit precise matching of gears.

For exacting applications like these, General Electric has developed efficient and dependable air conditioning and refrigeration equipment that provides accurate control of temperature and humidity. Available for war production uses now . . . it will be available for all uses after the war.

☆ BUY WAR BONDS ☆

General Electric Company, Air Conditioning and Commercial Refrigeration Divisions, Section 444, Bloomfield, New Jersey.

Air Conditioning by

GENERAL ELECTRIC

Hear the General Electric Radio Programs: The "G-E ALL-GIRL ORCHESTRA", Sundays, 10 p. m., EWT, NBC . . . "THE WORLD TODAY" News, Every Weekday 6:45 p. m. EWT, CBS.

the focal point of Precision

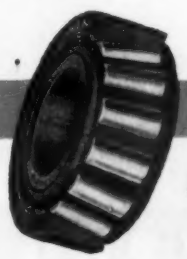
Warner & Swasey Turret Lathe with Timken Bearing Equipped Spindle making flood valve locking pins for submarines — a precision job

It's what happens at the spindle nose that counts in lathe operation; that is the focal point of precision.

Without a rigid spindle, free from chatter at every speed, feed and cutting load, no machine however good in other respects, can perform with maximum and consistent accuracy.

That is why Warner & Swasey turret lathes —long famous for precision—have their spindles mounted on Timken Tapered Roller Bearings. Nobody knows better than this manufacturer how well it pays.

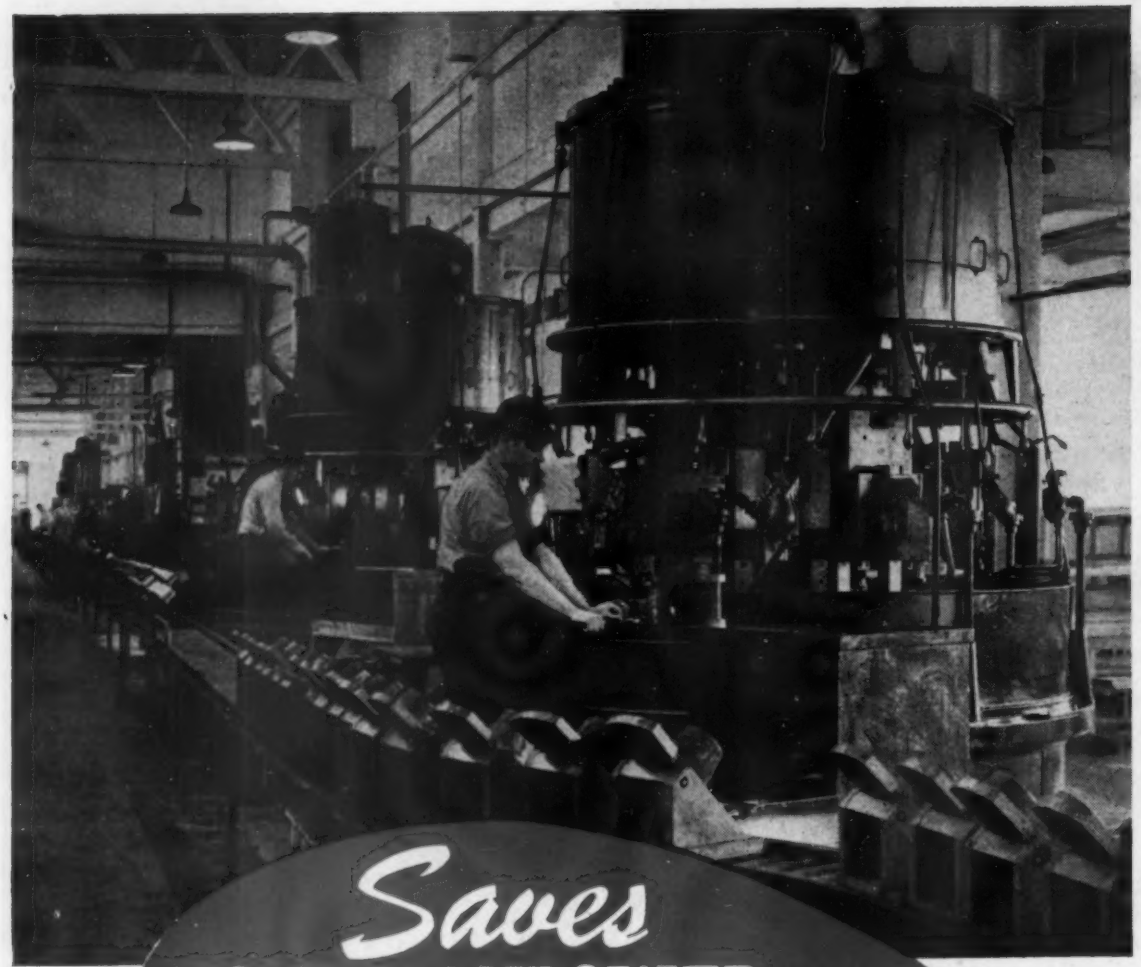
Ask this question when buying any kind of heavy duty machine tool: "Is it Timken Bearing Equipped?" The Timken Roller Bearing Company, Canton 6, Ohio.



TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



Saves YOUR MANPOWER...

On these two Bullard Mult-Au-Matics two men are doing the work which by other methods would require sixteen. That means fourteen men who can be used in other ways to aid the war effort.

The machine is so constructed as to guard against accidents. Its operating principles assure you that an operator's work-ability is nearly as high at the end of his shift as when he started. Furthermore, since the machine and tools are definitely set for the job, work is produced accurately over long periods of time by even unskilled operators. It is more important now than ever before to guard your operator's work-ability because of the present manpower shortage.

These benefits are no less important to you than the high productivity and extreme precision of Mult-Au-Matic output. And they will be equally to your advantage after the war is won.

THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT

Climb Milling is one of the outstanding features of the **No. 12 Plain Milling Machine** on present day requirements.

B&S BROWN & SHARPE MFG. CO.
PROVIDENCE 1, R. I., U.S.A.

Take *immediate* advantage of their many productive features for milling medium-sized work both on long and short run jobs—

Ample power—to pull the cut smoothly

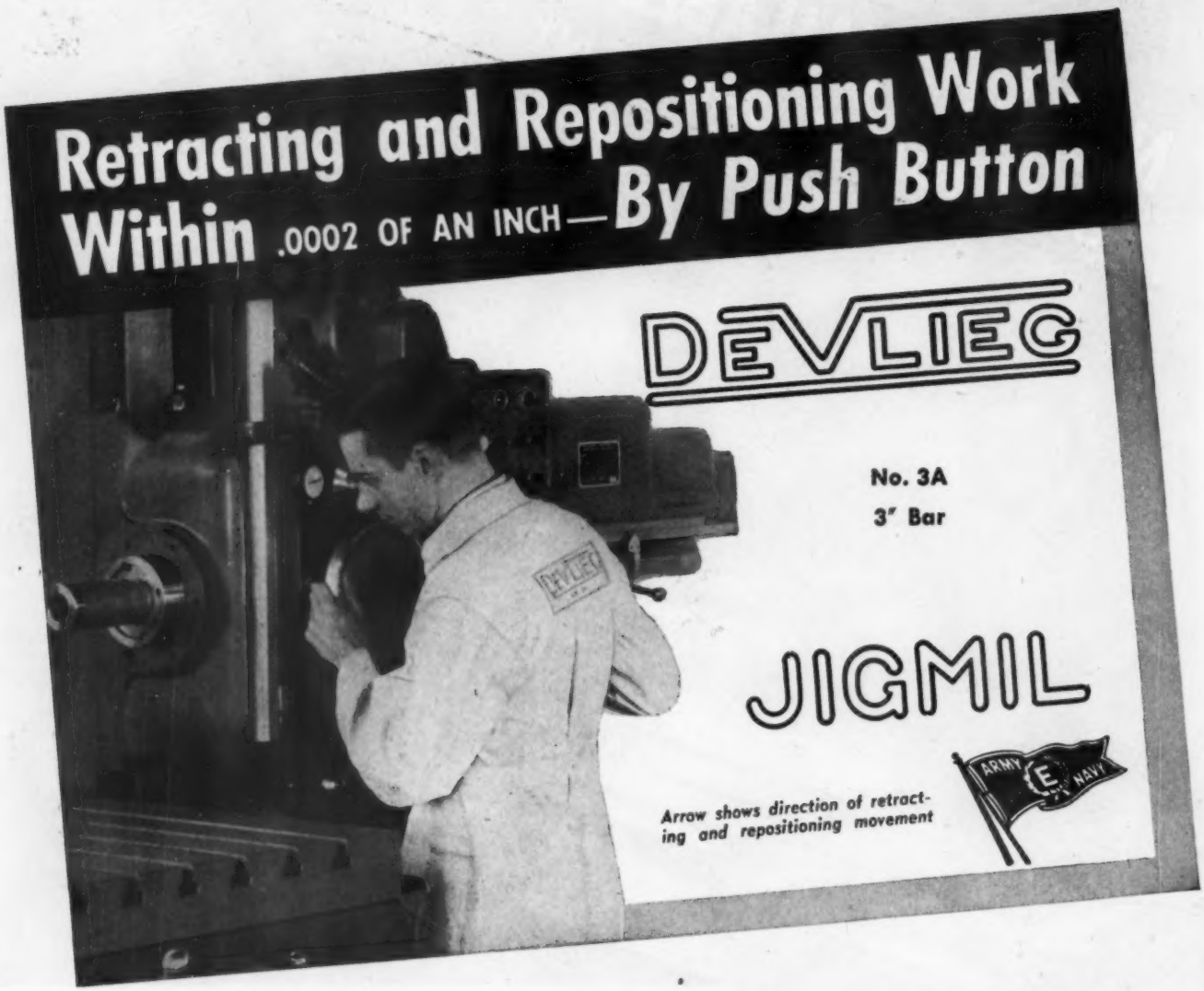
Machine rigidity—for heavy loads without vibrations

42 Speed changes (Standard and Intermediate) 25 to 1050 R.P.M.—permitting best selection for cutter and work

28 Feed changes—½" to 35" per minute—permitting most advantageous feed selection. Many may be used in **dual-combination** to reduce cutting time

BROWN & SHARPE

Retracting and Repositioning Work Within .0002 OF AN INCH—By Push Button



The most frequently needed function in a precision boring machine is that of retracting the work to facilitate measuring and tool setting.

In the DeVlieg Jigmil, this function is automatic—by fingertip control. Operation of a push button unlocks the table and moves it by rapid traverse to the desired position for measuring. For repositioning, operation of a single push button will cause the table to return to its cutting position by rapid traverse, stopping and locking automatically. Uniformity of selected position for stopping and locking is dependable within .0002".

The DeVlieg Jigmil is a new type machine—has the spacing accuracy of a Jig Borer—Performance Qualities of a Milling Machine—Convenience and Flexibility of a Horizontal Boring Mill. All control is so centered and organized that the operator never has to take his eyes off the work.

Thus, the Jigmil fulfills the machine tool ideal—a powerful and accurate extension of the operator's hand.

Many machines show 75 per cent greater average daily productivity.

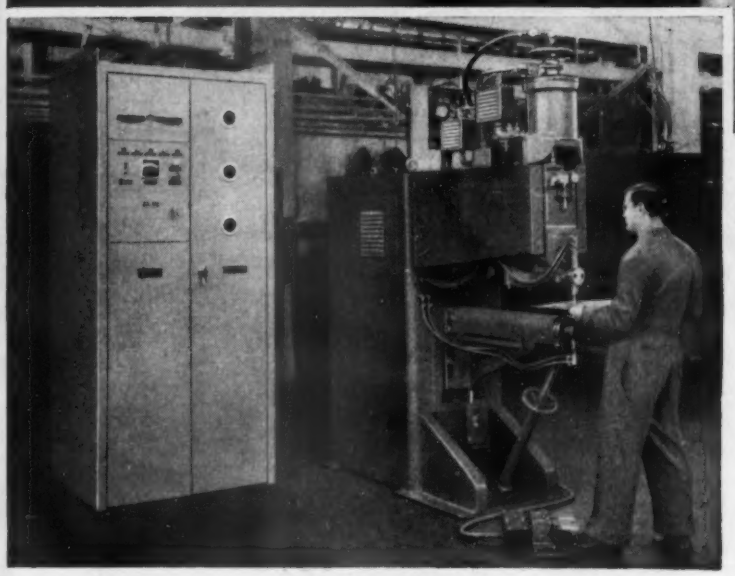
DEVLIEG MACHINE COMPANY

450 FAIR AVE. FERNDALE 20, (DETROIT) MICHIGAN

Write for Circular

DEVLIEG MACHINE TOOLS

Photo Courtesy Lockheed Aircraft Corp.



Use G-E CAPACITOR DISCHARGE CONTROL

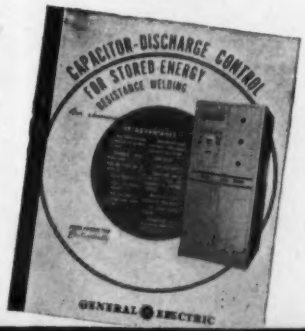
---It provides accurate forge-pressure timing for your stored-energy welding machines

CONSISTENT values of current and timing, so vital to uniform, high-quality, aluminum-alloy welds, are insured when your stored-energy welding machines are equipped with this G-E control. Experience proves that required welding energy is reduced and weld quality improved by the accurate forge-pressure timing provided by this control.

Because of its low demand kva, this control permits the use of welders on distribution systems which, without it, might be overloaded. Also, because of its low demand on the line, which means less voltage drop, you can economically install your welding machines in the most favorable places on your production line, even though the machine may be some distance from incoming distribution transformers.

Good voltage regulation, afforded by the low demand kva, also lessens the possibility of light flicker, and limits interference with other welding equipment on the same circuit.

The arrangement and accessibility of all parts of the control make it easy to install and service.



BUY WAR BONDS

GENERAL ELECTRIC

Want More Information?

General Electric Company, Sec. A645-29
Schenectady 5, N. Y.

Please send a copy of your bulletin, "Capacitor-discharge control," No. GEA-3728, which describes the control, tells how it operates, and explains where it can be used most effectively.

Name .....

Company .....

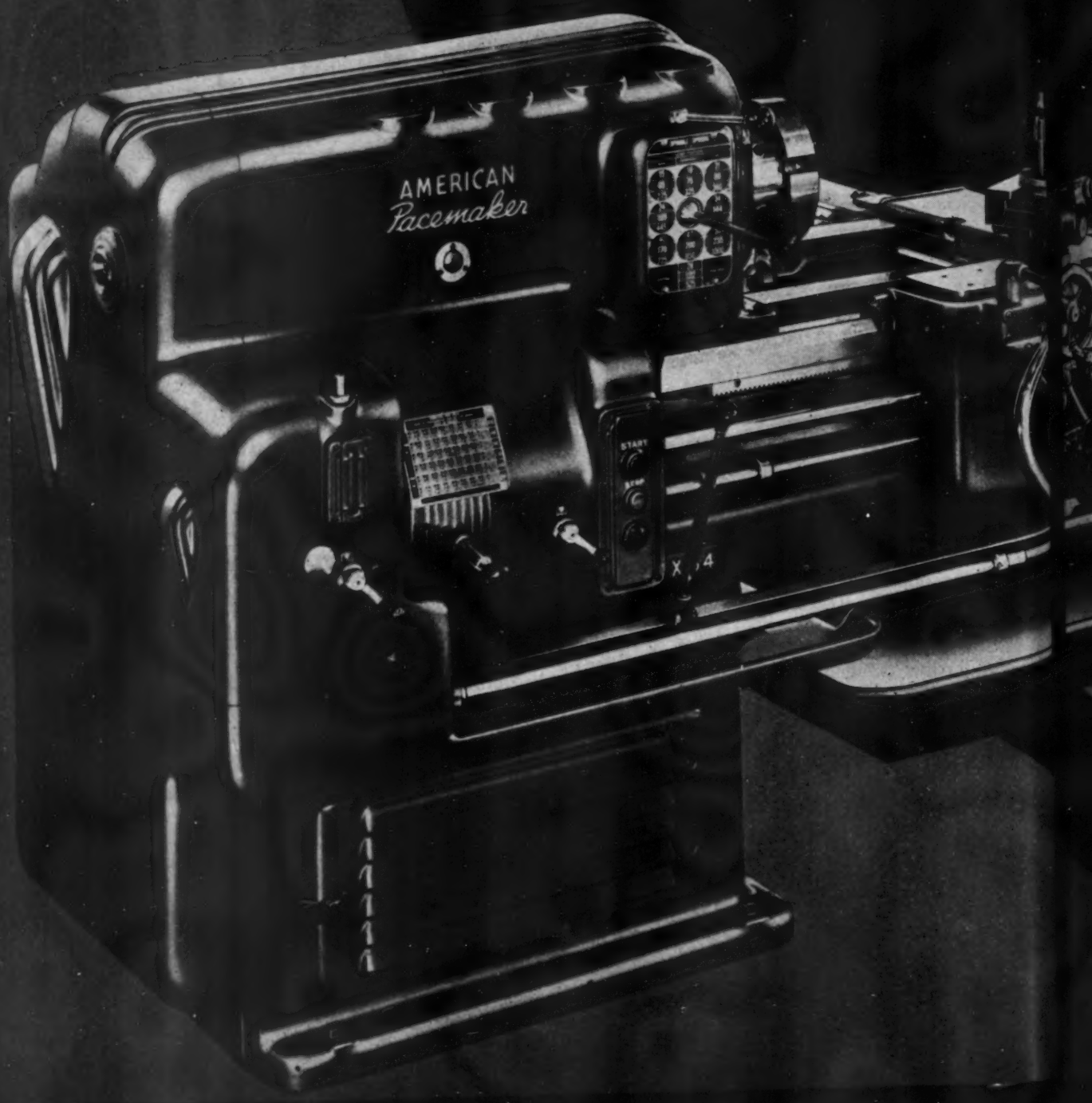
Address .....

.....

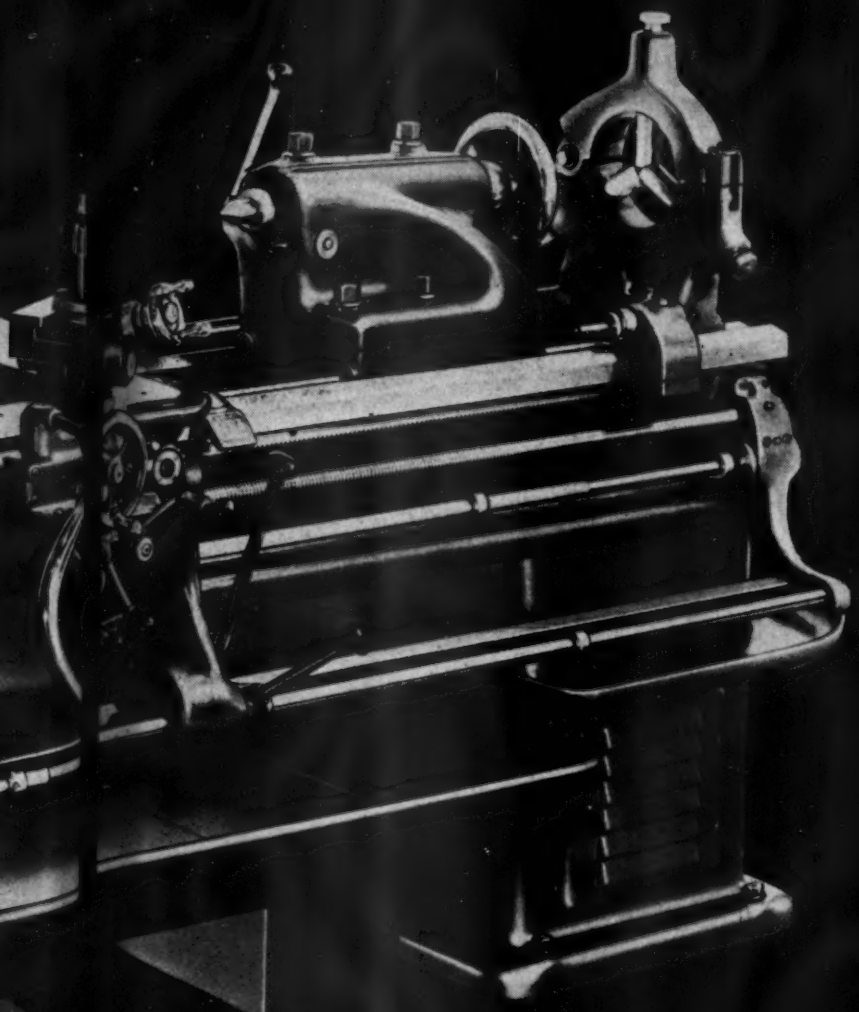
8960

FOR
ALL-OUT
PRODUCTION

PROTECT YOUR SHOP AGAINST
MAN-POWER SHORTAGE BY
UTILIZING THE EXTRA PRODUCING
CAPACITY OF . . . .



"AMERICAN" *Pacemaker* LATHES



The danger to production resulting from the induction of manpower from production shops, can be minimized, by replacing slow, inefficient, effort-consuming lathes with fast, convenient, easily-handled "AMERICAN" Pacemakers.

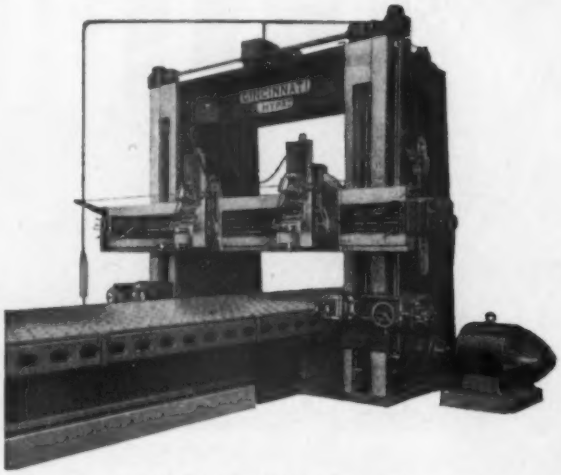
Time and again an "AMERICAN" Pacemaker operator easily produces as much work as two equally efficient operators on old machines. On the basis of manpower and machine productive power alone, the shop equipped with "AMERICAN" Pacemaker Lathes is in a far better position to maintain all-out production with fewer men and machines than the shop that clings to its old machines and the hope that it will not be caught by a shortage of machine operators.

Insofar as quality of work is concerned, the "AMERICAN" Pacemaker can be depended on for outstanding accuracy at all times and under all conditions.

LATHES
RADIALS
SHAPERS

The
AMERICAN
TOOL WORKS CO.
Cincinnati, Ohio

Complete Service Keeps Cincinnati Hypro Machine Tools Running Well All Over the World



120" Double Housing Planer
Sizes 24" to 120"
Described in Catalog 136

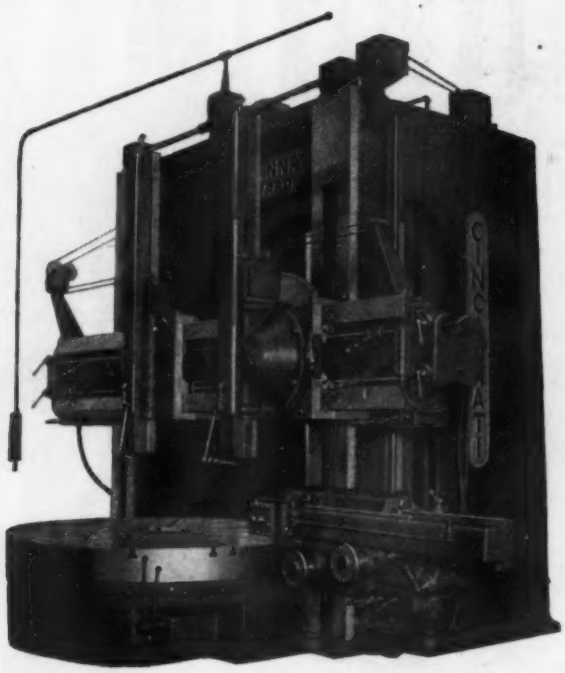
Frederick M. Selson, managing director of the Selson Machine Tool Co., Ltd., London, England, writes:

"All the planers, boring mills and planer type millers you have supplied to us are working very well. We have a complete service system here whereby every few months one of our service engineers calls in to see whether customers are absolutely happy with your machines."

Our customers in the British Isles have been kept absolutely happy with Cincinnati Planers, Vertical Boring Mills and Planer Type Milling Machines since July 1899.

Hypro service following the sale is not confined to England. Norman H. Benson, Australia; Bert Keller, Brazil; Francis Klein & Co., Ltd., India; H. S. Gray Co., Hawaii; Reunert & Lenz, South Africa; Rudel Machinery Co., Canada; and Stankoimport, Soviet Purchasing Commission for the U. S. S. R., sell and service Hypro machine tools. They too can testify to world wide preference for these Hypro-duction tools.

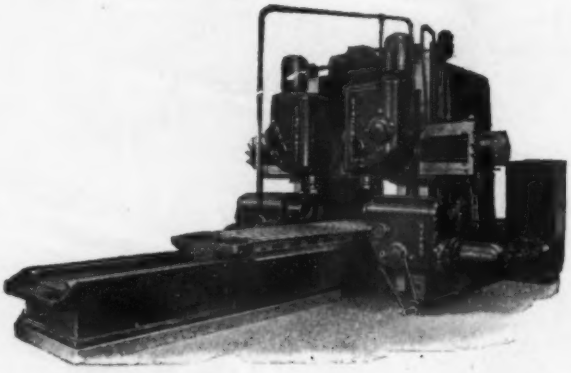
Cincinnati Planer Co. customers in the United States receive service from factory trained Hypro machine tool engineers and exclusive sales representatives.



8' Vertical Boring Mill

Sizes 8' to 12' and larger
Described in Catalog 175

Sizes 54" to 7'
Described in Catalog 131 just published

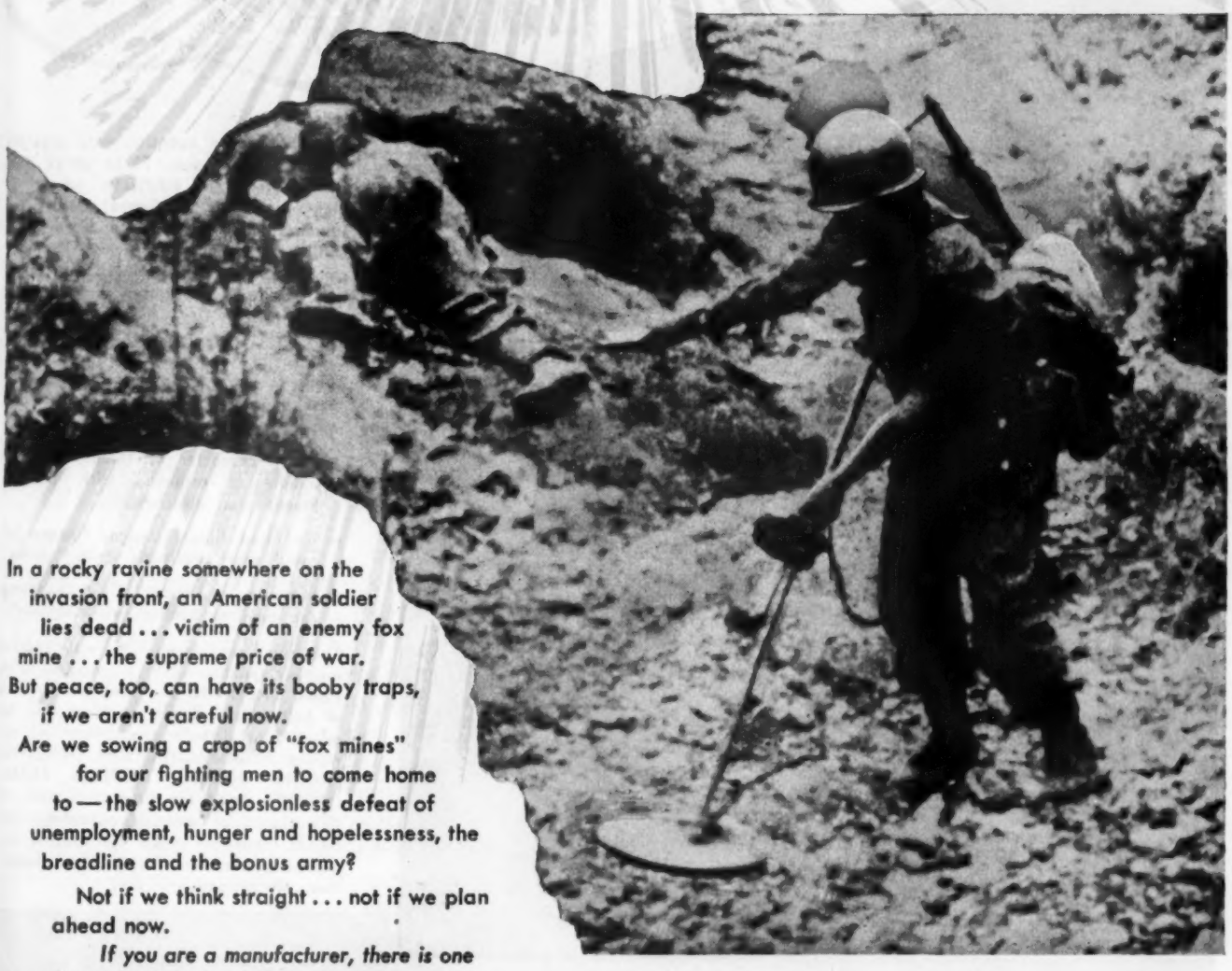


84" Planer Type Miller
Sizes 30" to 120"
Described in Catalog 105

The CINCINNATI PLANER CO. CINCINNATI 9 OHIO, U. S. A.

Are we sowing a crop of peacetime

FOX MINES IN AMERICA?



In a rocky ravine somewhere on the invasion front, an American soldier lies dead . . . victim of an enemy fox mine . . . the supreme price of war.

But peace, too, can have its booby traps, if we aren't careful now.

Are we sowing a crop of "fox mines" for our fighting men to come home to — the slow explosionless defeat of unemployment, hunger and hopelessness, the breadline and the bonus army?

Not if we think straight . . . not if we plan ahead now.

If you are a manufacturer, there is one thing that you can do at once: Have your production men and planners consult now with the engineers of the basic machine tool producers. They can help you in planning ahead for the difficult task of reconverting your own skills and machinery to an all-out peacetime production.

One of these engineers is a Bryant man. We urge you to call him today. For his specialized knowledge of internal grinding machinery is important to the manufacture of literally *everything* that will make this country a finer place: this is victory, a victory that it will be safe for our boys to come home to.

BRYANT CHUCKING GRINDER COMPANY SPRINGFIELD VERMONT, U.S.A.

BAKER

makes another contribution to the war effort!

Steel flanges, in quantity, were urgently needed for war use. Photo shows how the problem was efficiently solved by high production equipment with the standard single-spindle Baker Heavy Duty Drilling Machine as the basis. The machine illustrated—BAKER MODEL 217—uses receding type taps for tapping flanges (sizes 1½" to 4" taper pipe tap). Flexibility of the Baker Heavy Duty Drilling Machine for tapping operations is typified in this set-up, with these features making for better and faster production:

★ Better character of thread, because spindle is arranged with positive thread lead attachment

★ Simplified fixture design; flanges located over previously drilled holes

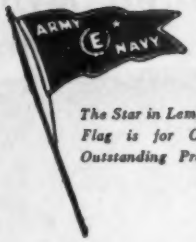
★ Minimum operating effort, enabling one man to handle two machines

This same model machine with special multiple-spindle head is applied with equal success to the multiple drilling of bolt holes. Baker machines can be adapted to virtually any special job involving HIGH-PRODUCTION DRILLING, FACING, BORING, TAPPING, REAMING. To speed war production now, to be assured of meeting peacetime demands later—ask Baker for specific engineering recommendations and bulletins. No obligation.

ARMY E NAVY

BAKER BROTHERS, INC.

TOLEDO 10, OHIO



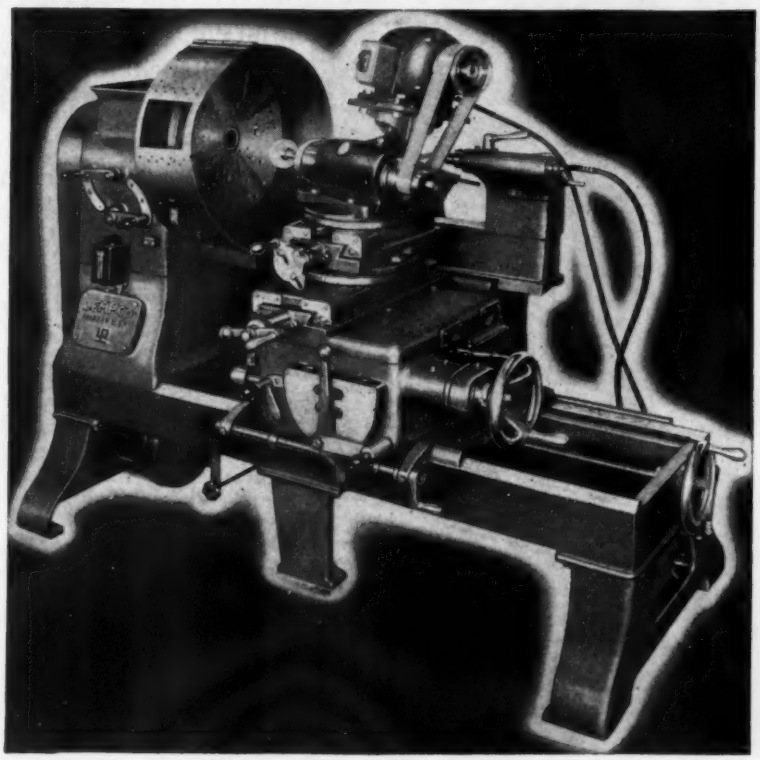
The Star in Lempco's "E" Flag is for Continued Outstanding Production.

WE USE THEM
AFTER WE BUILD THEM
SO THEY MUST BE GOOD!

LEMPCO

DESIGNERS • MAKERS • USERS
OF PRODUCTION-PROVED MACHINE TOOLS

HEAVY-DUTY UNIVERSAL
GRINDER



Turns and grinds, internal, external, face, and taper jobs! Three quick-change speeds for both cross-feed and table feed. Automatic trips and feeds insure accurate work even from new hands. Big 53" swing. Heavy duty spindle with matching, pre-loaded pairs of dynamically balanced ball bearings used in each end. Hollow work spindle with draw-bar provides fast, easy means for mounting work and fixtures to the face plate. Interchangeable turning and grinding heads may be switched in a few seconds. Four quick selective work spindle speeds. Three each quick-change table and cross-feeds, automatic in both directions. This machine has proved to be one of the most productive, efficient, and durable on our own production line.

WRITE FOR SPECIFICATIONS

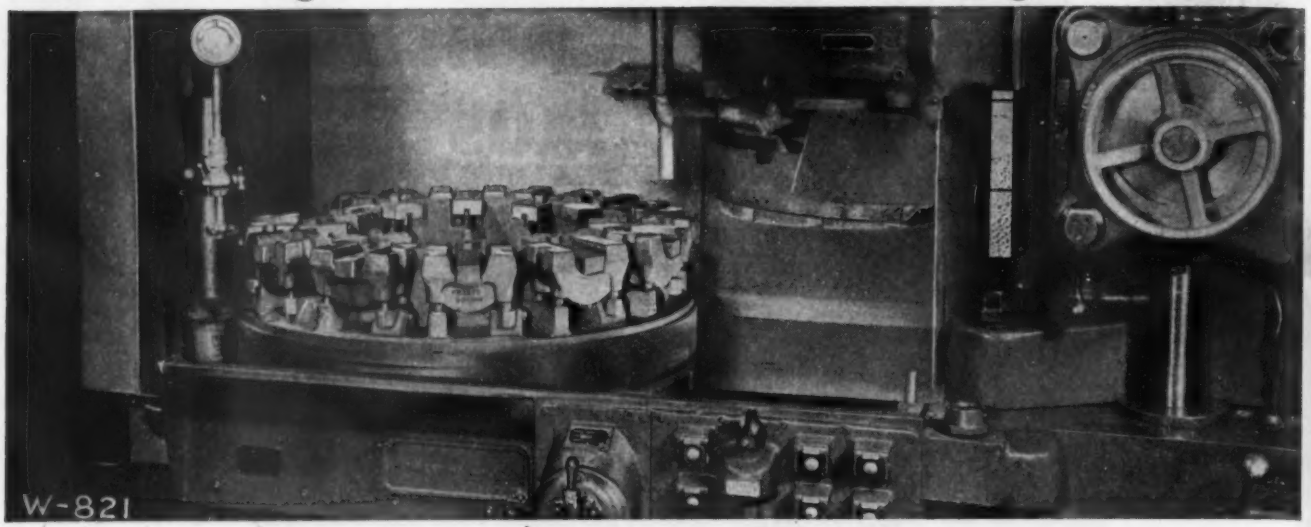
LEMPCO

5711 DUNHAM ROAD • BEDFORD, OHIO

PROMPT DELIVERY!

CEILING-PRICED!

★Production ★Adaptability Close Limits ★Operation Saving
Material Saving Fine Finish Fixture Saving ★Flatness



★Production ★Adaptability ★Operation Saving ★Flatness

Grinding Bearing Cap Joints

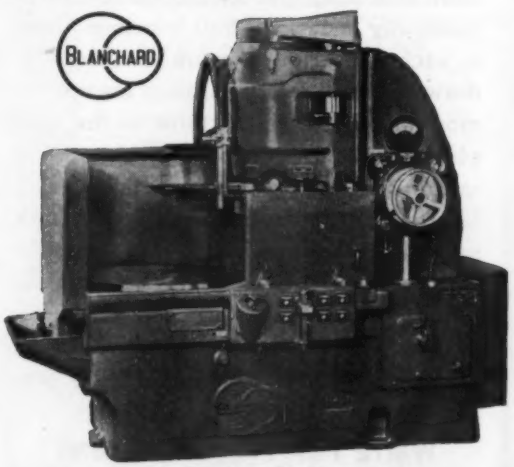
These nickel steel forgings are bearing caps for the master rods of radial engines.

The No. 18 Blanchard Surface Grinder removes from .060" to .090" of metal from twelve of these caps in one operation requiring 27 minutes.

This is only one of the many airplane engine parts that are being ground on the Blanchard, using magnetic, hand clamping or automatic fixtures.

"Put it on the Blanchard"

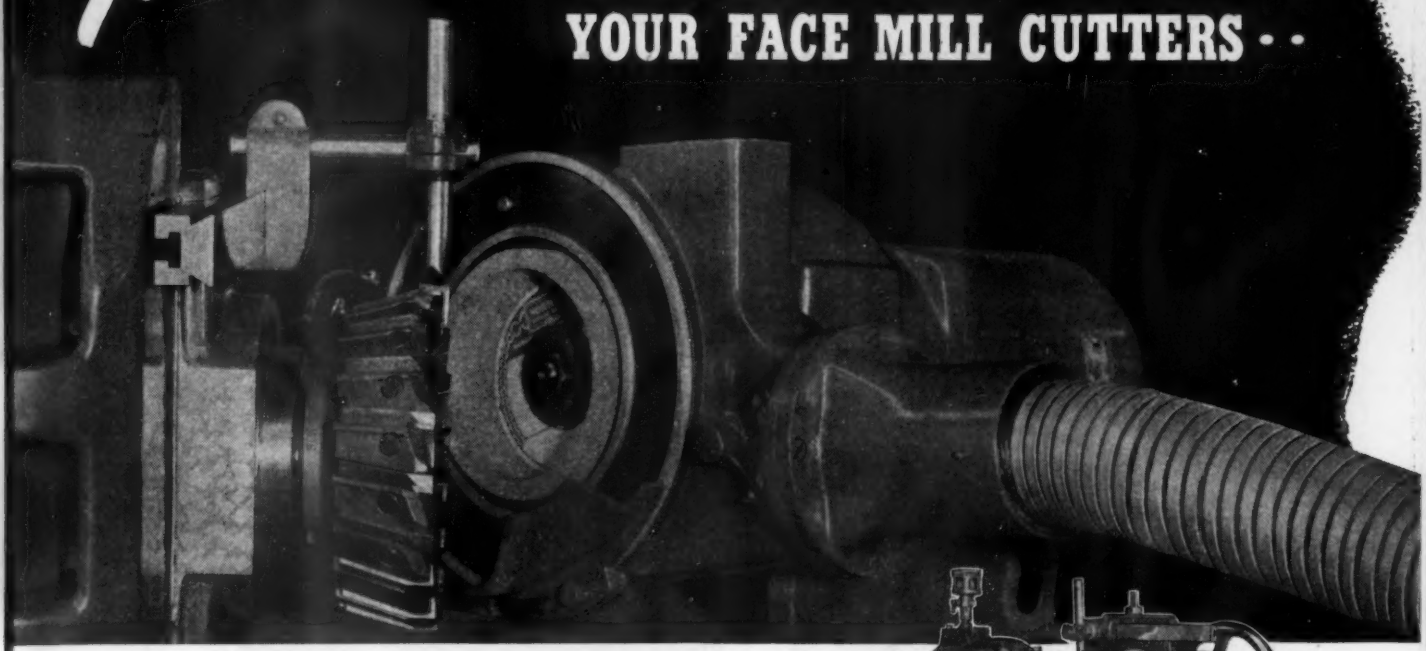
Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.



No. 18 Blanchard Surface Grinder

The BLANCHARD MACHINE COMPANY
64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

Increase PRODUCTIVE TIME BETWEEN GRINDS ON YOUR FACE MILL CUTTERS··



...Assure a Greater Return From Your Milling Machine Investment

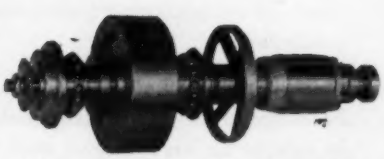
Avoid waste of valuable productive time by constant changing of face mill cutters. The Milwaukee Face Mill Grinder sharpens each tooth accurately — makes cutters last longer — require less frequent regrinding — decreases "down-time" on your milling machines.

An indispensable machine of strength, precision and capacity, the Milwaukee Grinder grinds Tungsten Carbide and other cutters, ranging from 3 inch to 16 inch diameters, to within .0002 runout — and does it fast.

MILWAUKEE FACE MILL GRINDER FEATURES:

- Unusual Rigidity
- Accuracy to within .0002 runout
- Finger-tip controls — handily located for simplified operation
- Design and performance of the Milwaukee substantially reduces sharpening time

- The three-bearing dynamically balanced grinding wheel spindle rotates at 3400 r.p.m.; heavy flywheel keeps abrasive wheel up to full grinding speed—maintains accurate uniform cutting action — each tooth perfectly ground.



- Set-ups quickly made with graduated dial, facilitating quick adjustments

For complete information write for Bulletin 41-A

Rotary Head Milling Machine
•
Autometric Jig Borers
•
Center Scope

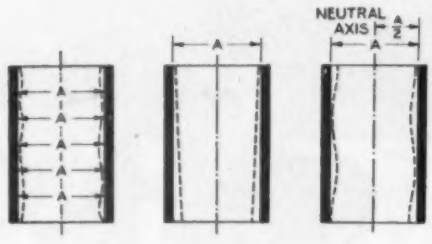
Kearney & Trecker *Products*
CORPORATION
Milwaukee, Wisconsin
Subsidiary of Kearney & Trecker Corporation

Milwaukee Face Mill Grinder
•
Milwaukee Midgetmill
•
Milwaukee Speedmill

MICROMATIC offers you
THE HYDROHONER

Accuracy, Uniform Size
Stock Removal
Controlled Surface Finish

THE HONING PROCESS



GENERATES
Diametric Roundness — **Diametric Straightness** — **Axial Straightness**

CORRECTS
Taper

Out-of-roundness — **Axial Distortion**

Micromatic Hydrohoner—
With Automatic Microdial . . .
Precision Hones to uniform size.
Machine stops when correct size is reached.

Micromatic Honing is a process for finish machining cylindrical surfaces—internal or external by means of controlled abrasion.

Abrasive sticks positively expanded by the hone, are rotated in contact with the work and are given one or more reciprocating motions at the same time—all actuated under extremely low speeds and pressures.

Stock is removed at rates up to .001″ per minute on diameter—to more than 1 cubic inch per minute in volume on hard, forged steel.

Roundness is generated—out-of-roundness is corrected within tolerances as low as .0001″ in many applications. Taper is corrected and diametric and axial straightness is generated by stones long enough to overcome deformity.

Uniform size is generated in high production to tolerances as low as .0005″.

Microhoned surface finish may be controlled to any degree—from matte (grey) to mirror (black).

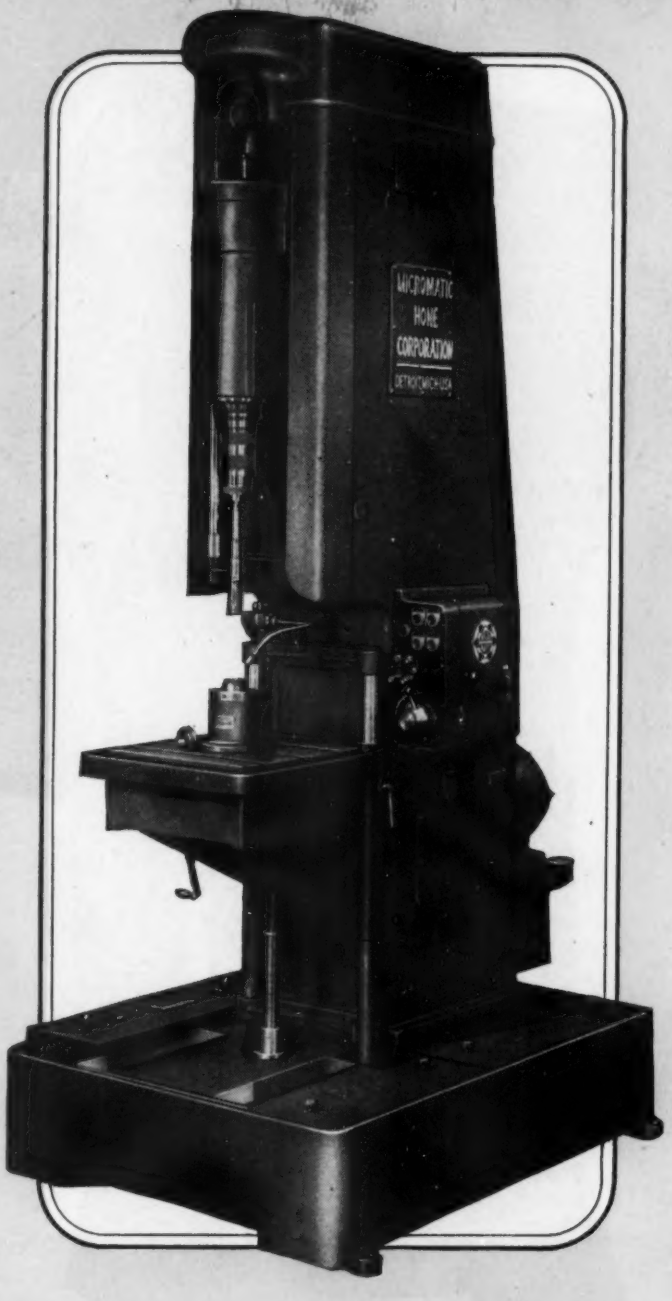
MICRO MATIC

Micromatic
HONE CORPORATION
Detroit 4, Michigan

MAKERS OF HONING MACHINE TOOLS

a New VERTICAL HYDROHONER

A High Production Vertical Type Hydrohoner



Diameter of Work . . . ¼" to 2".

Spline Driven Head Reciprocating Stroke . . . 15"—30"—40" (standard).

Spindle Oscillating Stroke . . . 0 to 1" maximum.

Centralized Hydraulic Operating Control. Panel provides easy operation—fast production. Hydraulic tool expansion assures uniform pressure and cutting rates for fast precision work.

Other features are—hydraulic timer—full ventilated hydraulic oil tank of 60-gallon capacity mounted in base.

Also available with 3-speed transmission, rising screw table, electric timer, special coolant filter, and special coolant refrigeration.

Available for normal prompt delivery.

Micromatic HONE CORPORATION

DETROIT 4, MICHIGAN

This Modern Cleveland Single Point Press, so called because it is designed with a single connection located in the center of the slide, has a bed area 36" x 36", stroke 12", adjustment 5", capacity 250 tons and is equipped with an electrically controlled, air operated friction clutch and brake. Other Presses of this series include Two Point and Four Point which have two connections and four connections respectively and each of the three types can be furnished in sizes and capacities to suit particular requirements.

THE CLEVELAND PUNCH & SHEAR WORKS CO. • *Cleveland, Ohio*

NEW YORK • DETROIT • CHICAGO • PHILADELPHIA • PITTSBURGH

FITCHBURG GRINDS ACCURATE TO .000025"

ASK FOR YOUR COPY

CONTINENTAL MACHINES
Incorporated
1301 WASHINGTON AVENUE SOUTH
MINNEAPOLIS

October 8, 1943

The National Machine Tool & Supply Co.
Att: Mr. C. O. Hanson
13 No. 1
Minneapolis, Minnesota

Dear Mr. Hanson:

I believe you will be interested in a job which we performed on the Fitchburg Grinder recently purchased from you.

The job consisted of grinding the O.D. of a piece of hollow tubing 1-1/2" in diameter and approximately 4" long. This part is used as a master squaring gage, and the grinding had to be held to extremely close tolerance of accuracy. Several attempts were made to grind the part by conventional holding methods, but it was found that upon releasing the work from the arbor it would distort beyond the limits to which the part had to be held. We finally devised a method of holding the tubing during the grinding operation, and using the Fitchburg Grinder we were able to grind 100 of these parts to an accuracy of 25 millionths maximum taper over the 4" length, and within 25 millionths of concentricity.

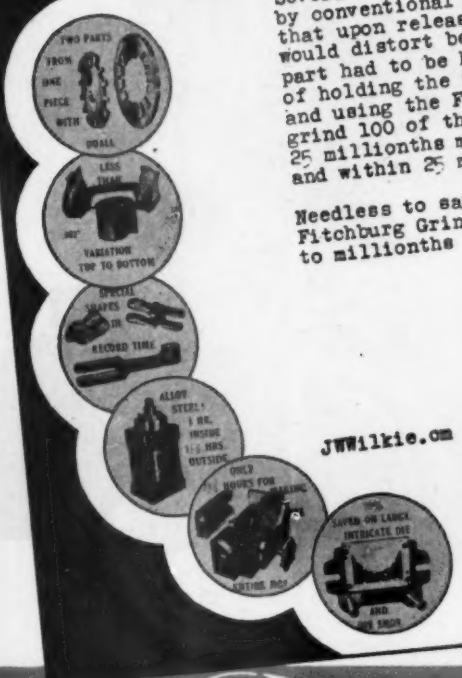
Needless to say, we are very well pleased with our Fitchburg Grinder when we can use it to grind down to millionths in accuracy.

Yours very truly,

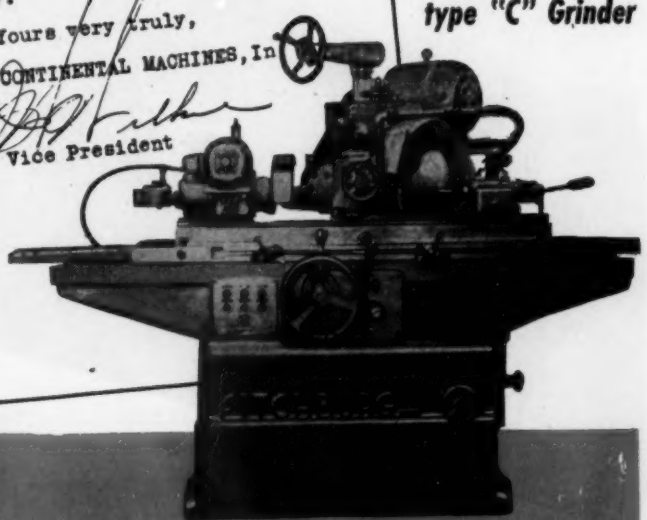
CONTINENTAL MACHINES, Inc.

Vice President

JWWilkie.cm


DO
BAND SAWING
BAND FILING
BAND POLISHING
TWO PARTS FROM ONE PIECE WITH ONE DRILL
LESS THAN .001" VARIATION TOP TO BOTTOM
SPECIAL SHAPES IN RECORD TIME
ALLOY STEEL: 1 HR. INSIDE 1½ HRS. OUTSIDE
ONLY 2½ HOURS FOR FINISHING
OUTSIDE DIA.
100% SAVED ON LARGE INTRICATE DIE
AND DIE SHOE

Unsolicited letter received by Fitchburg regarding type "C" Grinder



FITCHBURG GRINDING MACHINE CORP.
FITCHBURG, MASSACHUSETTS, U. S. A.

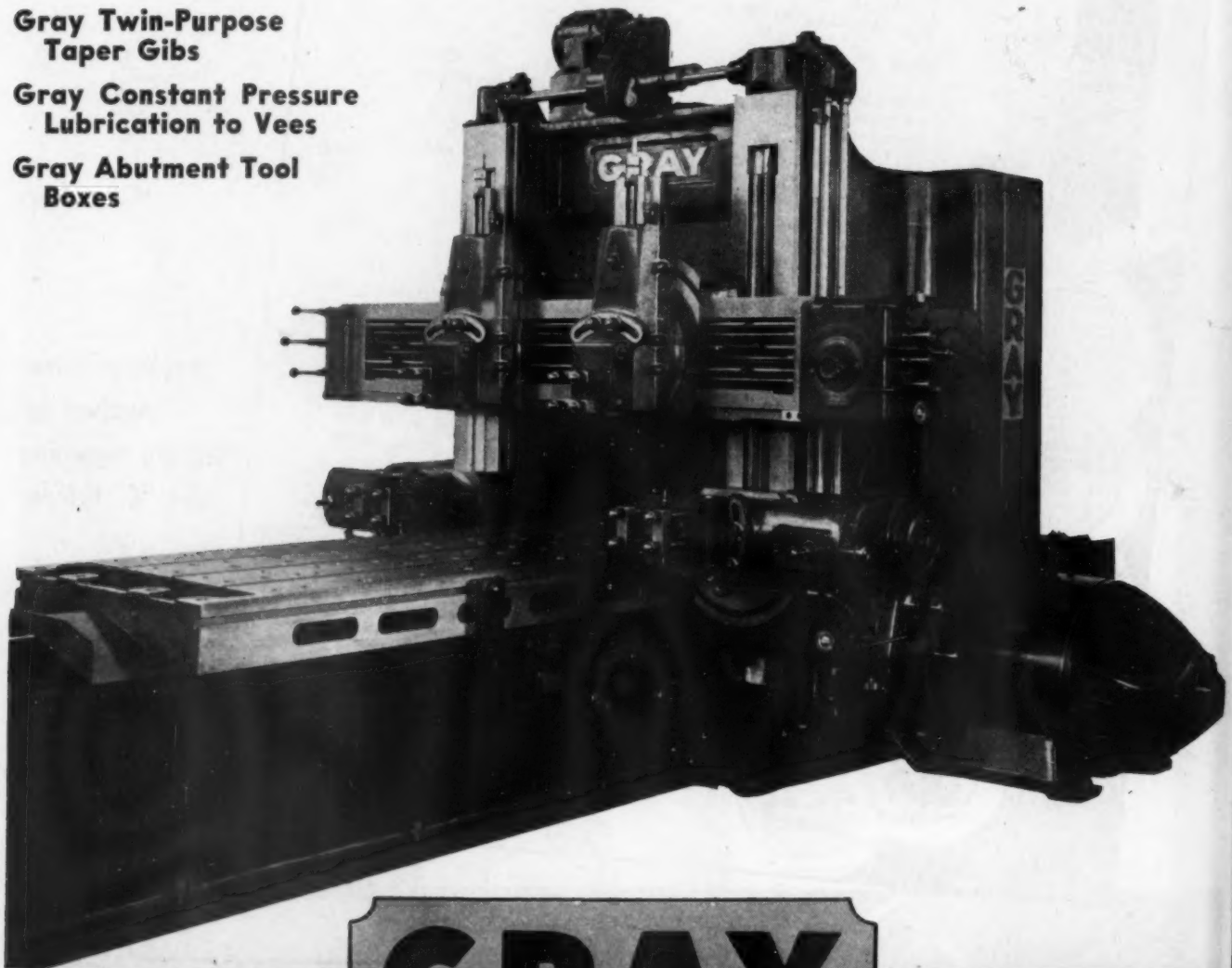
Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.

A Sure Sign of Precision Production . . .

GRAY *Maximum Service* PLANER *Double Housing Type*

- Gray Balanced Helical Gearing
- Gray Cantslip Dial Feed
- Gray Single-Shift Rapid Power Traverse
- Gray Tool-Point Control
- Gray Rail-Setter
- Gray Automatic Rail Leveling
- Gray Rail Lock
- Gray Twin-Purpose Taper Gibs
- Gray Constant Pressure Lubrication to Vees
- Gray Abutment Tool Boxes

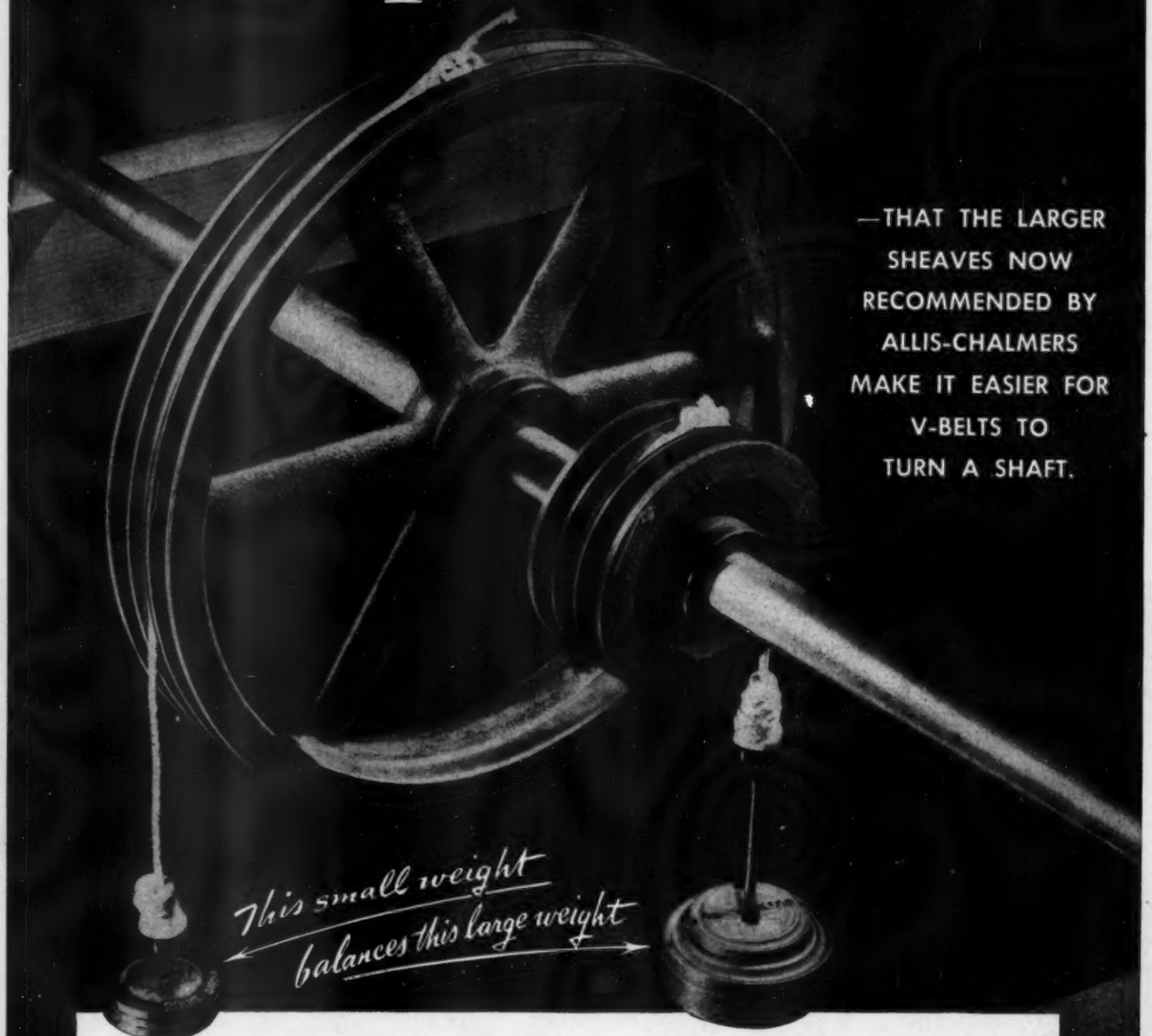
When you consider that all of these are patented features of Gray Double Housing Planers, you get some idea of the originality of design — sturdy, modern construction — experienced workmanship that goes into Gray Planers. It is also a sure sign of precision production at low cost.



THE G. A. GRAY COMPANY
Cincinnati Ohio, U. S. A.

THE GRAY LINE — Double Housing and Openside Planers, Switch Planers, Die Block Planers, Double-Housing and Openside Milling Planers, Planer Type Milling Machines, Horizontal Boring Machines

Simple Proof



—THAT THE LARGER SHEAVES NOW RECOMMENDED BY ALLIS-CHALMERS MAKE IT EASIER FOR V-BELTS TO TURN A SHAFT.

YES — THE RADIUS of a sheave is in effect a *lever* . . . and the larger a sheave, the easier it is for V-belts to turn the shaft on which it is mounted.

That's why using larger sheaves where practicable — a wartime recommendation by Allis-Chalmers—often reduces the number of V-belts needed to turn a given load.

You save rubber for the victory effort, save belt cost—and in most cases pay less for sheaves (when number of grooves is reduced, machining time is saved)!

Next time you figure drives, feel free to check with our district office. Or write direct to Allis-Chalmers, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

"It Pays to Make Allis-Chalmers your V-Belt Drive Headquarters"

A 1705

Tune in the Boston Symphony, Blue Network, every Saturday at 8:30 pm, EWT.

TOOLS WORK TWO EXTRA SHIFTS PER WEEK

SUNOCO
EMULSIFYING CUTTING OIL

increases tool life 35% . . . improves finish . . . at war plant

Machine tool men looking for ways to effect tool economies will find this case history valuable. It's about a plant producing armament parts, and how they increased tool life the equivalent of two extra 8-hour shifts in every 48-hour week.

Production was slowed because of trouble on machines using a competitive soluble cutting oil. Tool casualties ran high, finish of parts was inferior, emulsions showed a tendency toward rancidity.

Trouble stopped when they changed to Sunoco Emulsifying Cutting Oil upon the advice of a Sun Oil Engineer. Tool life increased 35% . . . finish was noticeably finer . . . rancidity stopped. And in addition, cutting oil costs were cut.

Now parts are speeded from the machines of this plant . . . and from hundreds of other plants that have found Sunoco Emulsifying Cutting Oil a spur to machine tool output. Sunoco's exceptional heat-absorbing quality and stability make it the answer for all metal cutting operations where a soluble oil is used.

For advice on cutting oil problems, write

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SUPER SERVICE

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SPEEDS UP

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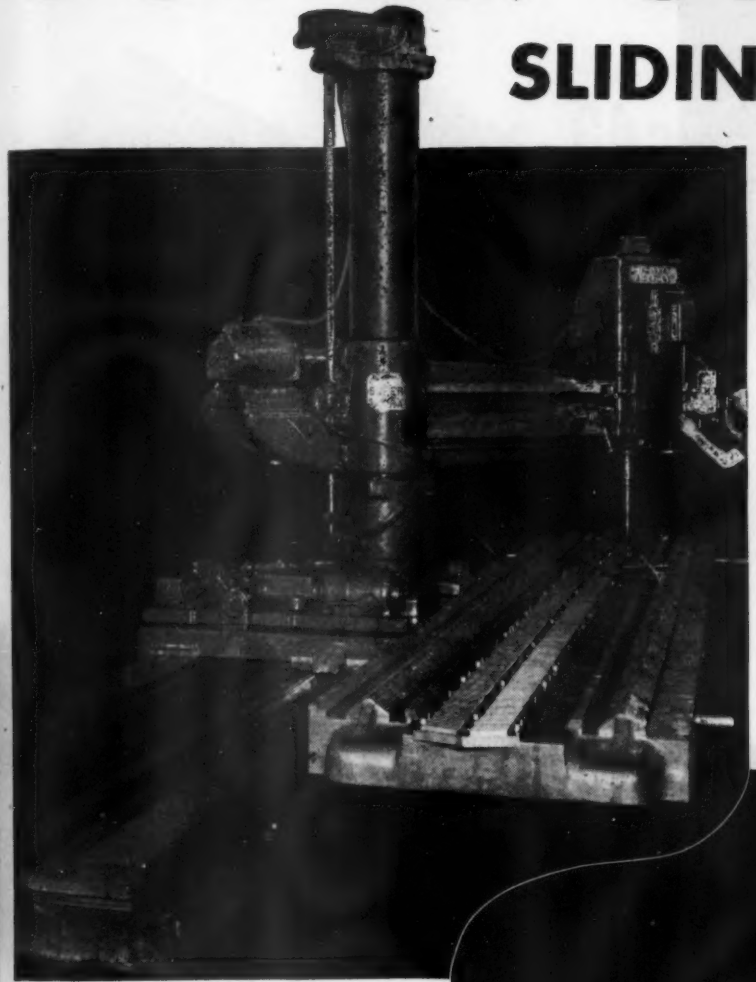

At the Cincinnati Planer Co. this planer table (62"x22') is being drilled and tapped, also drilled and reamed for taper pins that hold rack in place.

The Super Service "Sliding Bed" Radial Drill has facilitated a 20% cost saving by not constantly necessitating the use of the crane to reset the work. Now large work is set once or twice by the crane operator and the Super Service Radial Drill and the Drill Hand does the rest, thus greatly speeding up all-around production.

Send for further information about any Cincinnati Bickford Super Service metal drilling machines.

THE CINCINNATI BICKFORD TOOL CO.

OAKLEY · CINCINNATI · OHIO · U.S.A.

Cure for a Production Headache

REJECT tags on finished pieces are surely a headache.

And when these pieces have been rejected by inspection because of thread inaccuracies, it is a big headache—yes, a costly headache because tapping or threading is usually the last of a series of precision machinings. *A reject at this stage means a loss of all the painstaking and time-taking machine work which has been done on the piece before it came to the tap or die head.*

To remedy these troubles which are an epidemic in many shops striving for volume production of parts that must meet strict Army and Navy specifications, we offer a new machine for high precision tapping and external threading.

The Warner & Swasey Precision Tapping and Threading Machine enables average operators to cut class 3, 4, and 5 gage threads at faster rates with remarkably low percentage of rejects and almost complete elimination of tap breakage.

A new principle is utilized, a patented combination of lead screw and electrically actuated guide fingers. The upper portion of the lead screw hobs mating threads into the guide fingers; these matching threads can be quickly recut to compensate for wear and avoid lead errors and backlash. Solenoid action engages guide fingers and lead screw to control precision lead during tap travel.

If rejects, due to tapping trouble, are slowing up your production, we urge that you consult your Warner & Swasey representative.

Or write for catalog describing 4 models of Warner & Swasey Precision Tapping Machines for large and small work capacities from 0-80 to 1½".

WARNER & SWASEY Cleveland

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TURRET LATHES, SADDLE AND RAM TYPES • CHUCKING AND BAR TOOLS • PRECISION TAPPING AND THREADING MACHINES

An Always Changing Process

NOT LONG AGO high officials in Washington were talking about having completed the machine tool program for the war effort.

What they really were saying was that the tooling up was about finished and machine tools no longer were a source of anxiety.

Now along come several new programs simultaneously that need immediate attention.

Heavy artillery and large shells are required in huge amounts, presumably for both the European and Pacific areas. New production contracts have been awarded and new machine tools must be acquired as rapidly as possible before munitions output can be expanded.

Aircraft engines larger and more powerful than previous types, necessitating new tooling, are wanted by the services. Russia must have more machine tools with which to help rebuild her partially shattered defense industries and thereby hasten final victory.

These fresh demands, piled on top of a considerable volume of war orders still pending, strengthen the belief that it will be a mistake to count out the machine tool industry until the war is over.

There has been a succession of special war production programs from the beginning. At first it was shell and ammunition and guns. Then it was tanks, and afterwards ships and planes. Still later it was heavy trucks and then landing craft. Now it is heavy artillery and plane engines.

Military authorities will tell you that the fluidity of war makes it inevitable that new production programs will spring up as long as the war lasts.

Strategy shifts, and experience teaches our field commanders that they must be prepared to throw into the combat at unexpected intervals both new and improved weapons and, in some cases, a lot more of a certain item than anticipated.

It would be a grave error, under the circumstances, for the government to adopt any policy that would impair the ability of the machine tool industry to produce badly-needed machines in any emergency that may develop while the war is on.

How much direct war business in prime or subcontracts can be taken by machine tool builders without engaging facilities that may suddenly be required for machine tools for war work a few months hence?

How many workers in machine tool plants can be inducted into military service and still not delay present and future programs?

These and other leading questions must be answered with a fine degree of judgment and foresight. The answers are not easy.

But in arriving at what seem to be the right answers, we should be conscious of the value of "playing safe." Early in the war we and our allies lost because of having too little and being too late.

There will be no excuse for getting caught in that predicament again, especially in machine tools.

In our machine tool policy for the duration, we must constantly be ready for whatever may come up, because war itself is an ever-changing process and we must keep pace with it if we are to be victorious.

Burnham Finney

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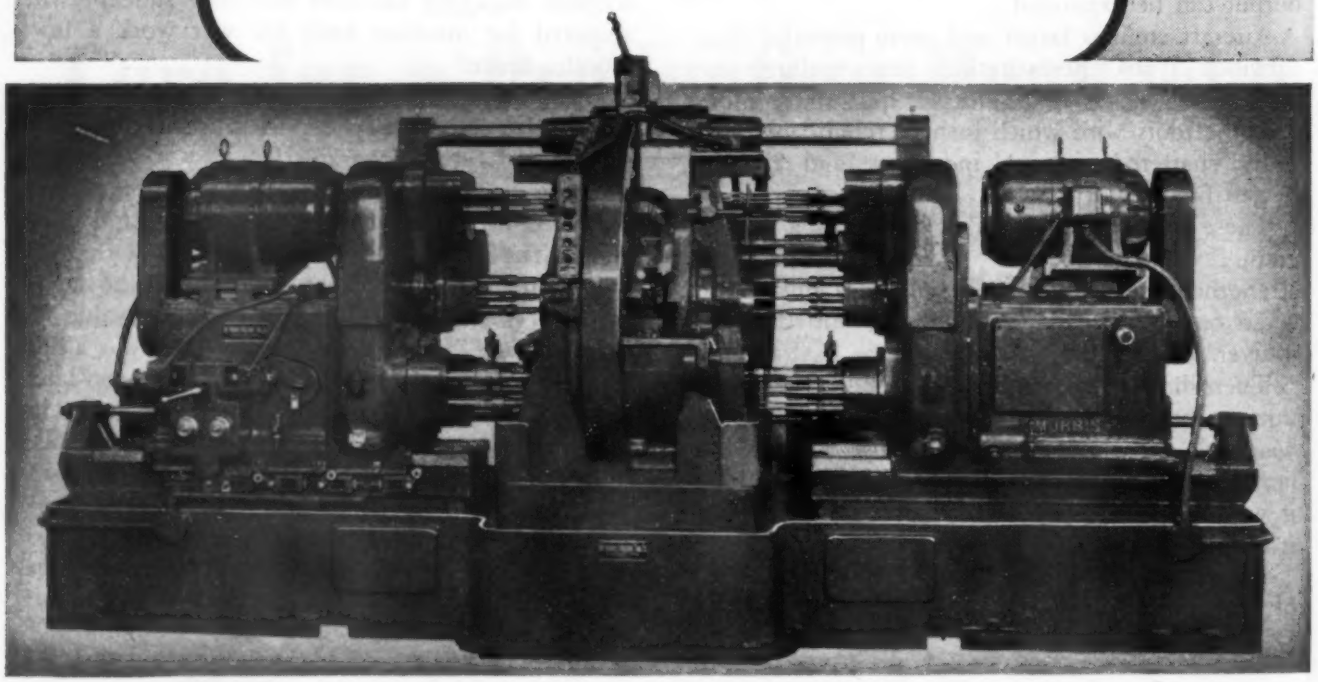
● Here's how Morris simplifies an apparently complicated operation—increases production of work—cuts production costs.

The machine consists of two 7½ H.P. hydraulic feed units mounted on opposite ends of a rigid base. Forty-four spindles are mounted in clusters for drilling, boring and reaming the work piece—an oil pump body—from two directions. The work is held rigidly by five hand clamp fixtures and indexing is accomplished by hand.

This is only one of a wide variety of machines designed—developed—and built by Morris to meet a specific job requirement. As you plan for low cost—high production—consult Morris Engineers—they can help you.



Builders of MOR-SPEED *Radials*

The MORRIS *Machine Tool Co.*

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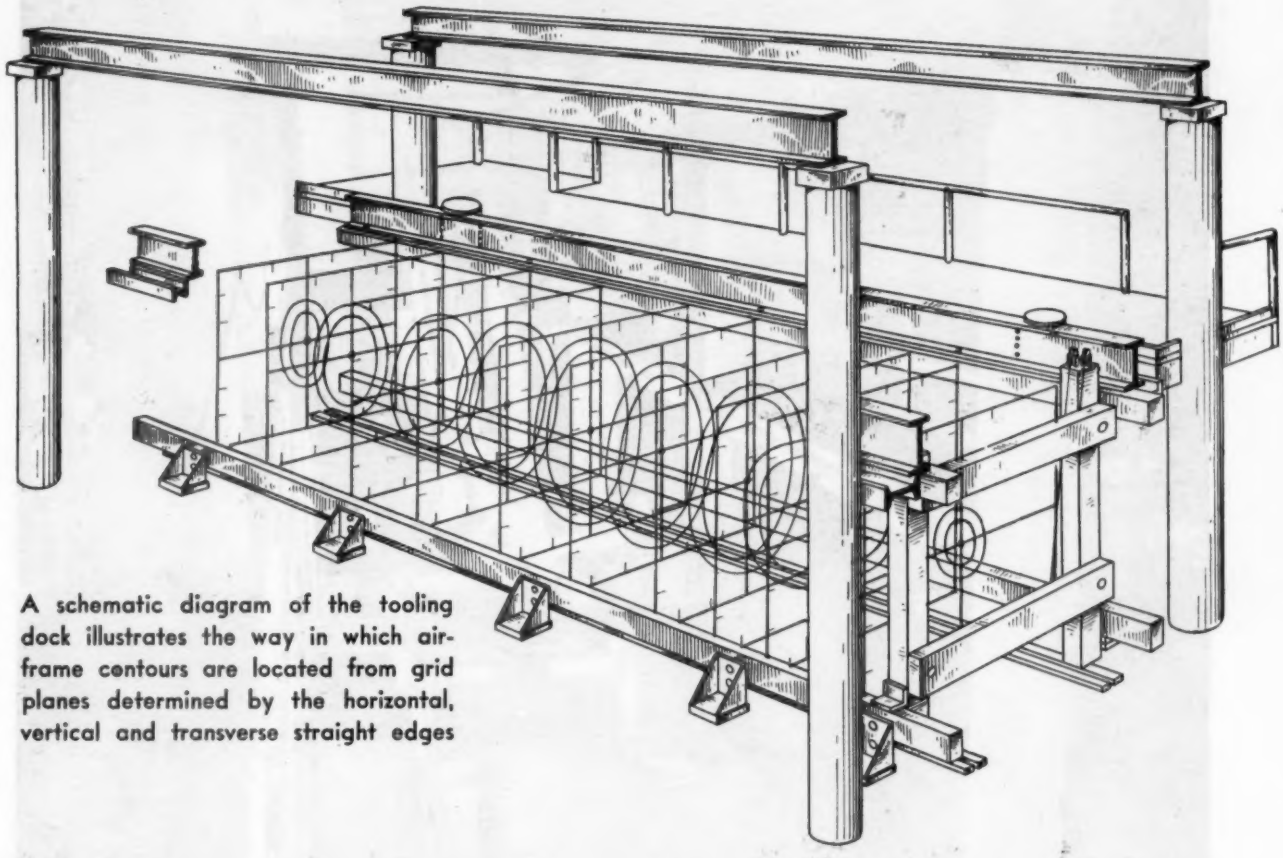


A schematic diagram of the tooling dock illustrates the way in which airframe contours are located from grid planes determined by the horizontal, vertical and transverse straight edges

Tooling Dock Speeds Airframe Fixture Assembly

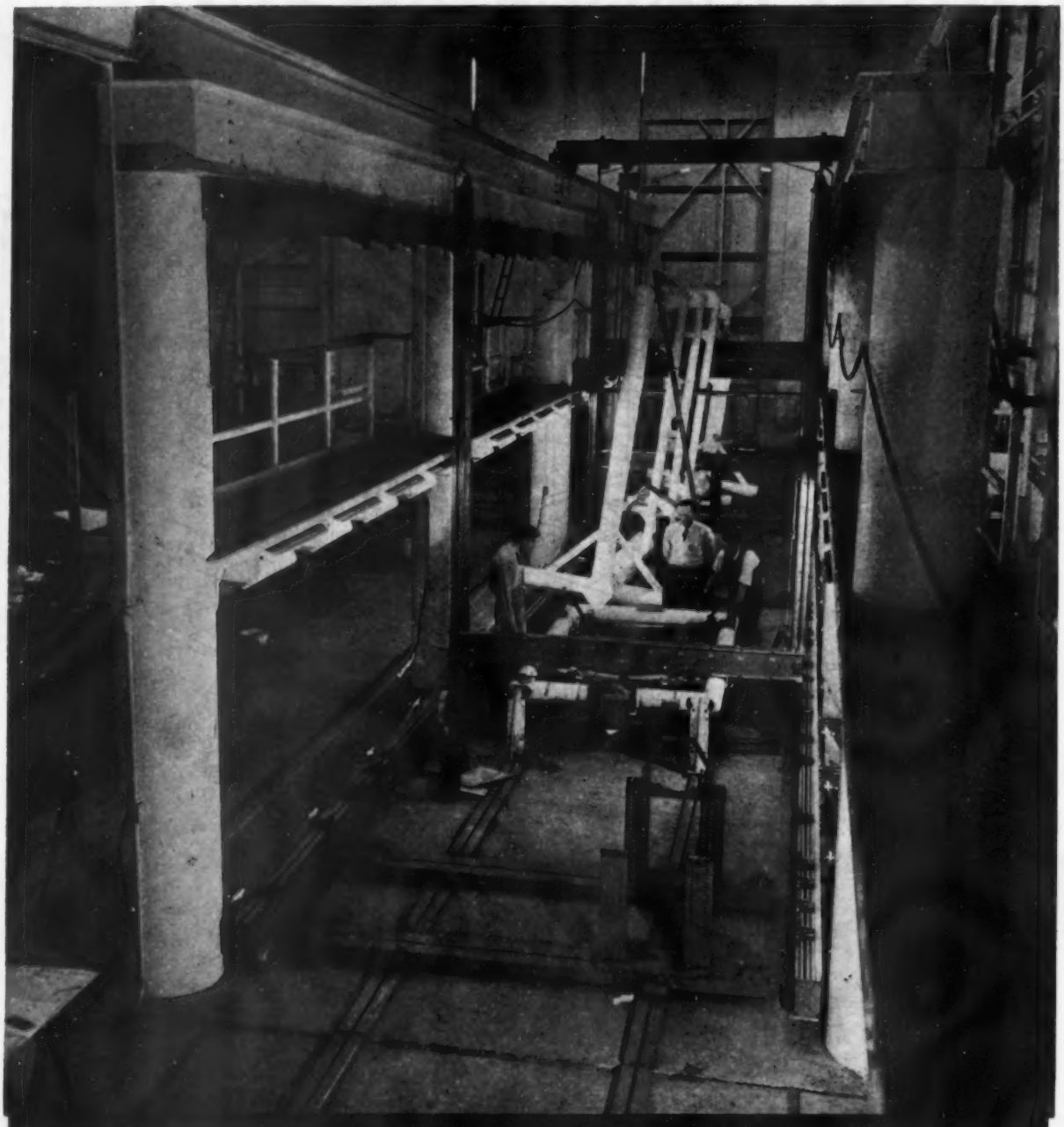
JOHN HAYDOCK, MANAGING EDITOR, AMERICAN MACHINIST

What the airplane has done for transportation, the tooling dock has paralleled in the field of assembly tooling. Each has made three new advances: increased speed, greater precision and the mastery of the third dimension

BOILED DOWN TO ITS ELEMENTS, the master tooling dock is a universal three-dimensional surface plate. It is capable of locating accurately a point in space and transferring that point to an airframe assembly fixture, a master jig fixture or a production check fixture. It has also been used in building prototype airplanes to precise layout dimensions.

The importance of the tooling dock lies in the fact that its use telescopes weeks into days in tooling up for a new airplane or in modifying existing fixtures to provide for changes. Thirty-seven fixtures were assembled in the dock in a recent month of 25 working days. On one new model, tooling, which would ordinarily have taken a year to complete, was ready in three months. In addition to a saving in time, this device brings new standards of precision to airframe assembly.

The new tooling dock, now in operation at the San Diego Division, Consolidated Vultee Aircraft Corporation, is the evolution of nearly four years of



Consolidated Vultee's master tooling dock is a dramatic device for transferring engineering loft dimensions to aircraft fixtures. Note the insulated concrete foundation and the heavy concrete-filled pipes which support the superstructure. Two fixtures are shown in the dock with additional frame locating dollies in the foreground. Time required to build fixtures is sharply cut with this device

research and development by Leland A. Bryant, its inventor. Other divisions of this concern are in the process of adopting the same type of equipment to their needs.

To visualize fully the advantages of the tooling dock, one must consider it in relation to recent trends in airframe manufacture. Interchangeability of subassemblies is today essential in order to maintain military aircraft on our battlefronts and to obtain the breakdown of a ship into easily handled units, the key to efficient manufacturing practice. The old method of building an airplane, as carpenters build a house, meant hundreds of man-hours wasted in cutting, fitting, drilling and riveting under awkward and inefficient conditions in large major assembly fixtures, to say nothing of the countless installations of electrical and hydraulic controls that had to be made after the structural work was completed.

Such practices have now yielded to sound manufacturing methods wherein the assembly process is lined up in a sequence of simple mating operations. In the case of the smaller subassemblies, a maximum

amount of work is accomplished on semi-automatic equipment, and individual parts are prepared for mating through extensive use of piercing dies and coordinated drill jigs. The successful application of this principle of manufacturing breakdown depends on full coordination of these subassemblies, and that is where the master tooling dock comes in.

The modern airplane is designed with sweeping contours. The mating surfaces between subassemblies are seldom in a single plane and follow no simple geometric pattern. On the contrary, the joints are made up of a series of points in space which must be accurately located in fixtures made to hold the subassemblies while they are being put together.

Before the advent of the master tooling dock, each point had to be tediously determined by means of transits, surface plates, piano wires, oil bobs, scales, height gages and verniers. No two men, however painstaking, could achieve the same result using such methods. Consequently, toolmaking technique fell behind the needs of the aircraft industry.

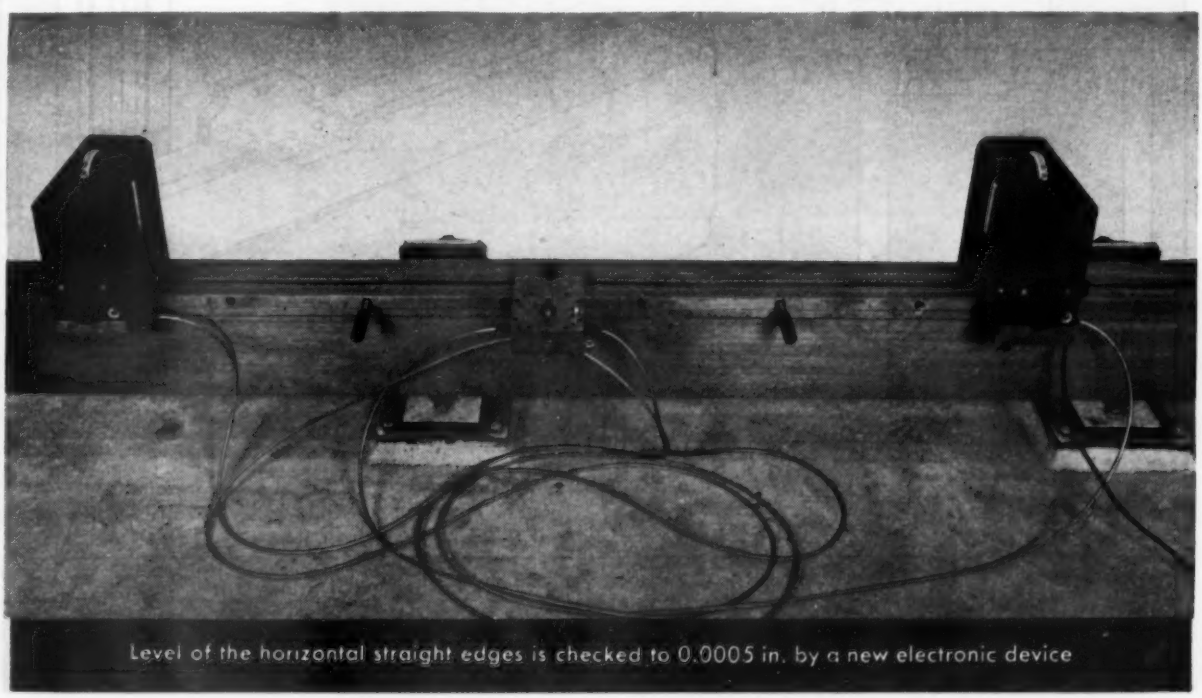
The master tooling dock takes advantage of the fact that modern aerodynamic design, or "lofting" practice, makes use of reference lines ten inches apart. The Dock presents a physical duplication of the theoretical dimensional grid system of the engineering loft, thus creating a common reference source for the use of tool and fixture makers.

The dock employed by the San Diego Division consists of two units, one 60 ft. in length and the other 20 ft. in length. For the sake of simplicity, only the larger unit will be described in detail. This unit has a working area 10 ft. wide and 15 ft. high. Its heavily reinforced concrete foundation, supported on steel piling, is 60 ft. long, 17 ft. wide and 5 ft. deep, and was designed to resist soil movements caused by tide changes, and vibrations caused by earth tremors, drop hammers and the traffic of moving heavy equipment. The concrete slab is surrounded by an expansion joint of 2-in. asphalt-coated fiber board to insulate it from the building floor. Similar slabs, 20 ft. in length, at either end of the working area and insulated from it, provide loading spaces. This dock will handle the largest assembly fixtures that it is practical to use in the manufacture of heavy bombers and cargo planes. In fact, three or more fixtures can be built in the dock simultaneously.

Straight Edges Mark Reference Planes

The key elements of the tooling dock are three sets of straight edges, representing respectively, length, width and height. Several features are common to all of them. They are made of steel box sections, each having a T-slot running the full length to clamp certain accessories. Each has a carefully machined working surface, scraped to reduce surface irregularities. Each is jig bored on one edge for 0.500-in. bushed holes on 10.000-in. centers. The holes run the full length of the straight edges and are located with extreme accuracy since they determine the grid lines which are the basis of all point location. The holes are numbered for identification.

Two of the four longitudinal straight edges which determine the dimension of length are mounted on adjustable floor supports while the two others are supported by the superstructure directly above them.

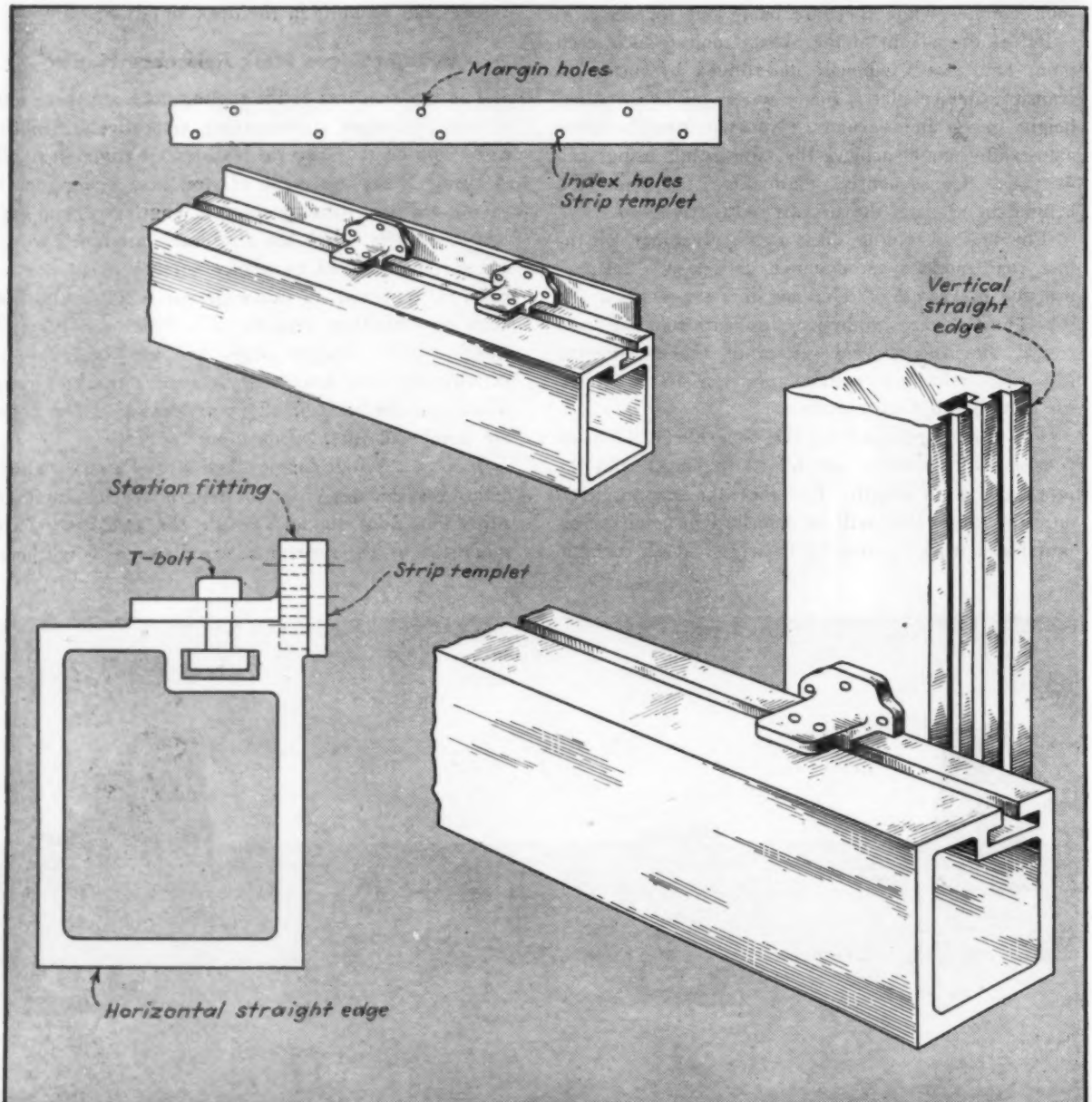


Level of the horizontal straight edges is checked to 0.0005 in. by a new electronic device

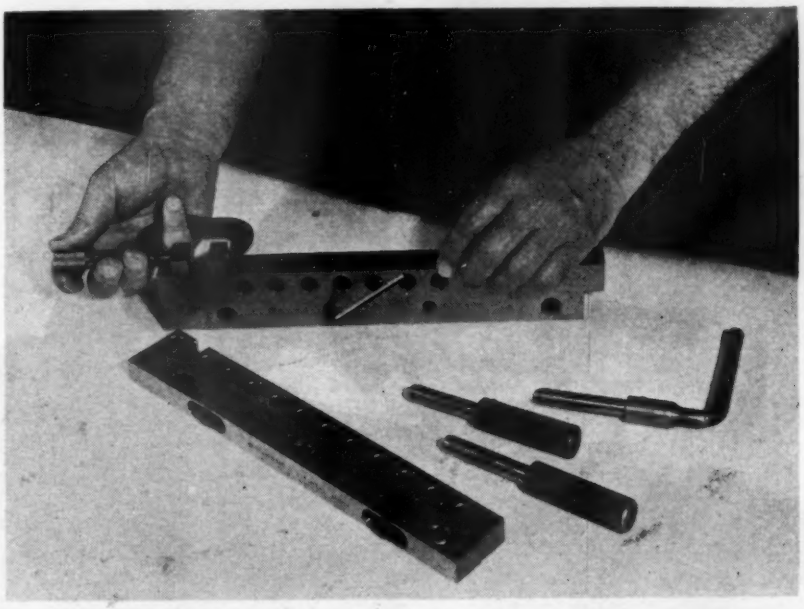
In addition to the longitudinal straight edges, the gridded body is bounded by two vertical straight edges for the height dimensions, or water lines, and by transverse straight edges for width dimensions, or buttock lines. Actually the 60-ft. tooling dock has two additional pairs of vertical and transverse straight edges for use in simultaneous set-ups.

Longitudinal straight edges are set true to line and level, and are checked with an electronic leveling apparatus to a tolerance of 0.0005 in. This instrument has a central reservoir of mercury which is connected by tubing to two detector units set along the length of the straight edge. Each unit has a metallic plate which acts as one element of a condenser. The mercury flowing from the central reservoir to these units forms the opposing plate of each condenser. Electronic tubes indicate the difference in condenser air gaps and are calibrated to determine accurately any variation in level between the units.

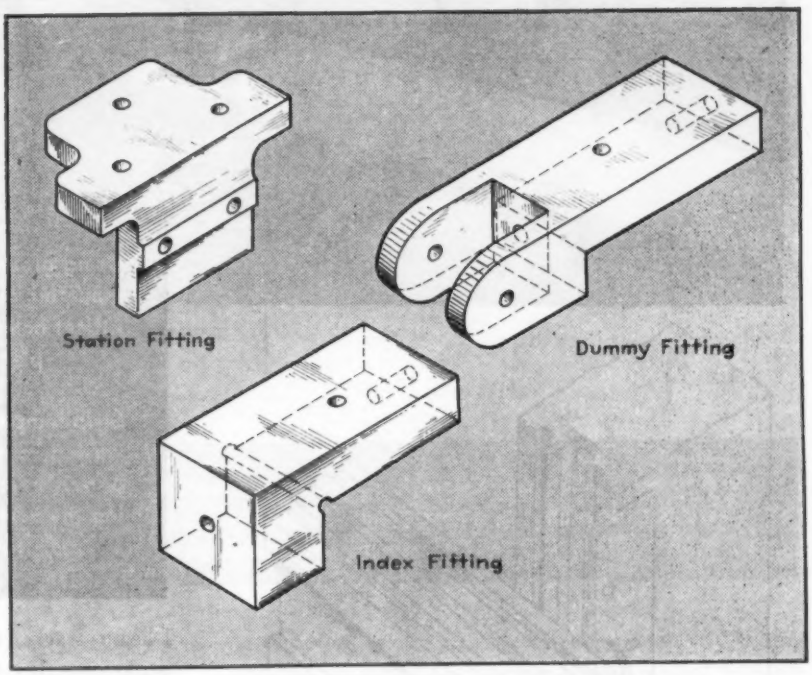
Upper and lower longitudinal straight edges are checked for parallel relationship to each other by means of an electric light indicator and checking gages at 50-in. intervals. In addition, sine bars are used diagonally between right- and left-hand longitudinal straight edges to check the transverse alignment of the index holes.



Index holes in the strip templet are spaced to match grid holes in the straight edge. Margin holes, offset to locations determined by the engineering loft, are used to position station fittings through the use of ground pins. The station fittings, after being locked in place, support the vertical straight edges



The adjustable set bar locates dimensions in thousandths of an inch between the grid holes spaced at 10.000 in. intervals in the dock's straight edges. The master bar (rear) is set with micrometers. Settings are transferred to the working bar (foreground) with ground pins for use on the dock



Certain accessory fittings facilitate the use of the dock in transferring loft dimensions from the grid planes to the fixture locators

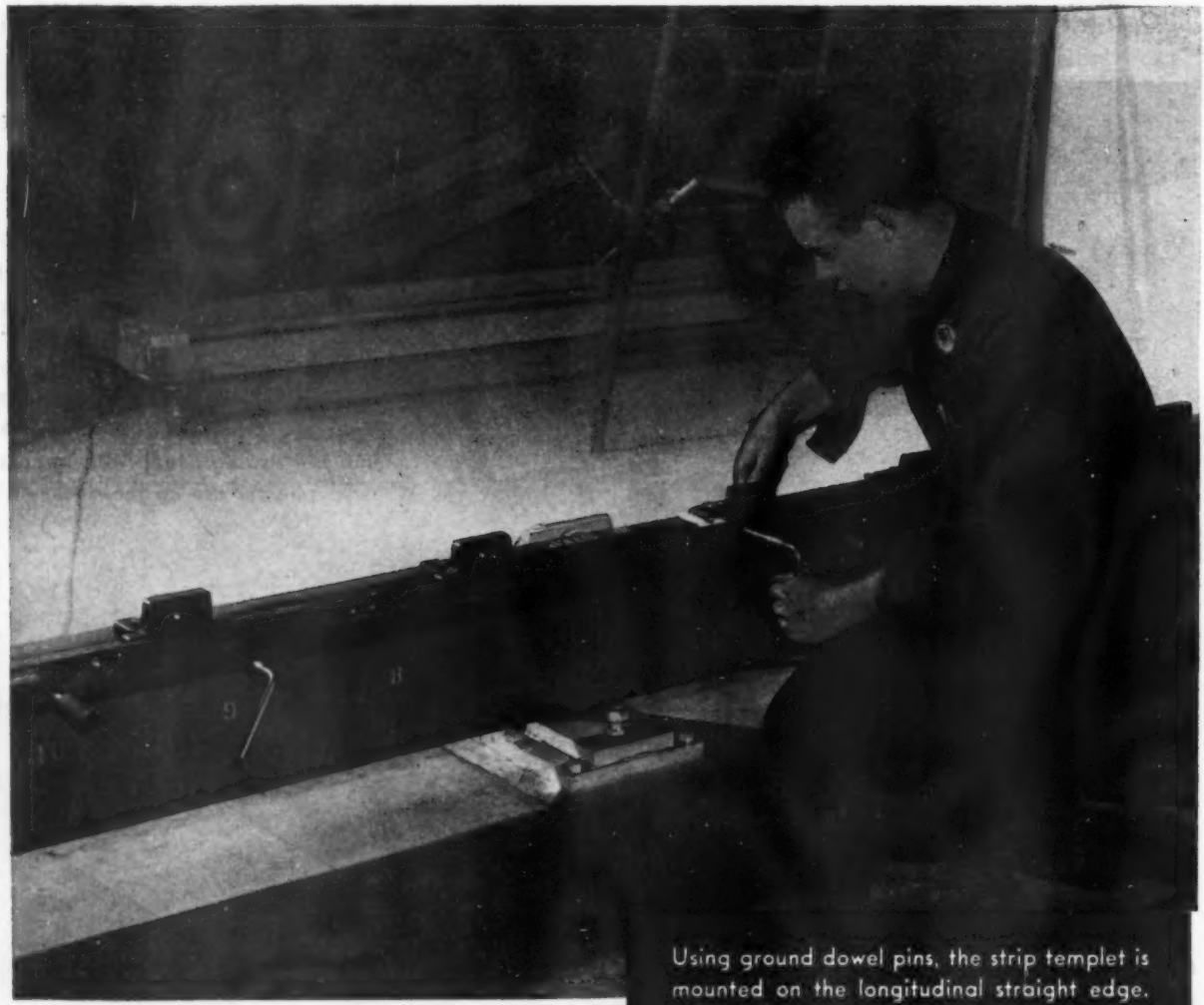
Longitudinal straight edges are made in 20-ft. lengths with expansion gaps between them. A master index drill bar provides continuity of the 10-in. increments between the lengths. These straight edges are fixed after their initial setting with micrometer screws. However, the vertical and transverse straight edges are adjustable to any position along the longitudinal straight edges.

The transverse straight edges are mounted on two vertical straight edges. Counterweights inside the vertical straight edges are connected to the ends of the transverse straight edges with cables and pulleys so they are balanced for easy operation.

In this way the vertical straight edges simulate the face of a drafting board while the transverse straight edge is analagous to a conventional parallel used on such a board. By means of an overhead crane a set of vertical and transverse straight edges may be moved fore and aft in the work area and positioned at any transverse vertical plane.

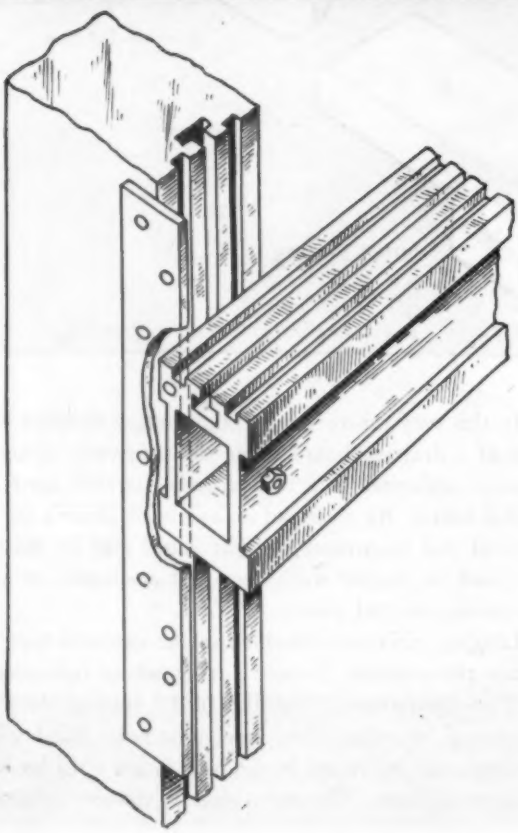
Loading rails are imbedded in the concrete base to locate the assembly fixture during set-up operations.

The superstructure of the 60-ft. tooling dock is supported by eight 22-in. steel pipe posts filled with concrete and imbedded in the foundation with hooked reinforcing bars. The posts support rubber-cushioned



Using ground dowel pins, the strip templet is mounted on the longitudinal straight edge. Offset holes on the opposite side of the templet locate the station fittings

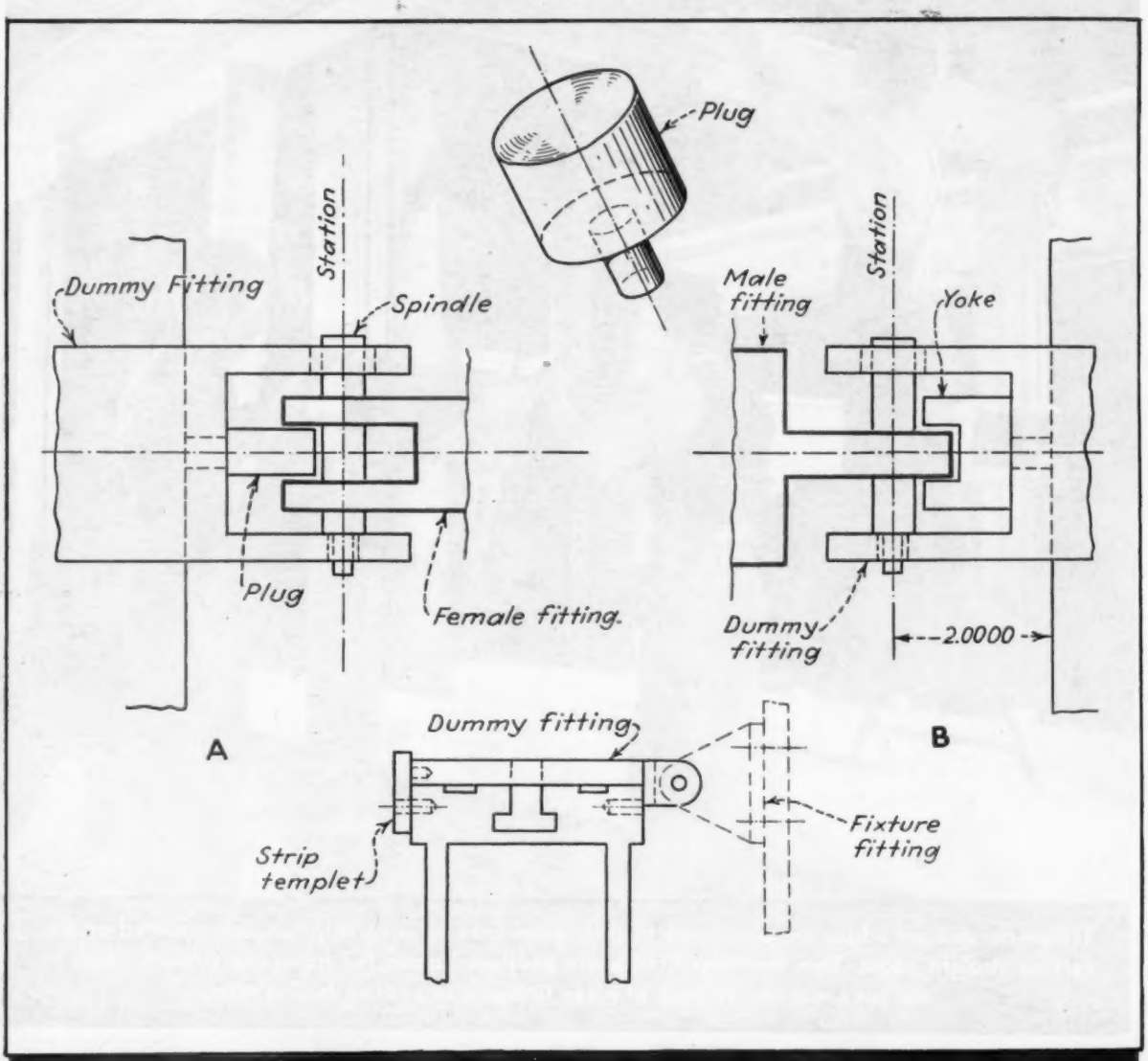
Strip templets may also be used to determine vertical positions of the transverse straight edge. The procedure is the same as for locating the vertical straight edge except that no station fittings are required



I-beam tracks, for overhead cranes, as well as catwalks on either side of the dock. A row of fluorescent lights under each catwalk illuminates the working area.

Certain accessories facilitate the use of the tooling dock. Their description will serve to illustrate how the reference holes in the straight edges are employed to fix any three-dimensional point in the working space.

The *strip templet,* or location gage, is made of ½ × 2-in. cold-rolled steel, with jig-drilled 0.500-in. holes on 10.000-in. centers. These match the bushed holes in the straight edges on which they are mounted by means of ground pins. In the opposite edge of the strip templet 0.500-in. margin holes are jig bored at the precise offsets called for by the basic dimensions



Dummy fittings are used to position female fixture fittings as at *A* or male fixture fittings as at *B*. A plug is inserted in the fitting in the first case and a yoke in the second. Each is ground to fit the fixture fitting. The spindle completes the location

of the airplane. These strip templets are master records and give dimensional control for every point it is desired to establish in the tooling of a given airplane. They are used repeatedly in set-ups for various assembly fixtures and insure their coordination.

The *adjustable set bar* may be used in place of the strip templet, particularly in settings on the transverse straight edge. It consists of two steel bars dovetailed together so they may be adjusted lengthwise in relation to each other or locked in any position by means of Allen screws. One bar has two 0.500-in. holes on 10.000-in. centers to match the holes in the straight edges. The other has a series of 0.500-in. holes on 1.000-in. centers numbered for identification. Hardened steel blocks at one end of the bars measure 1.000-in. over their outer surfaces when the end holes in the two bars are in accurate alignment. By sliding one bar along the other a gap can be opened between these blocks, increasing the outside measurement by any desired fraction of an inch. Through the use of a micrometer measurement over the blocks, they may be locked at a predetermined setting. The combination of 10.000-in. hole centers on the straight edge, 1.000-in. centers on the set bar and the micrometer measurement in fractions of an inch may be used to locate any point within the range of the straight edge.

In everyday use, settings are made on a master set bar which is kept in its own box on a bench. Each setting is transferred to a working bar, similarly constructed, by means of ground pins. The working bar is then used on the dock. Use of the set bar

Transverse straight edges are positioned to their water lines by using strip templets mounted on the vertical straight edges. Then the index fittings are positioned along the transverse straight edges in the same manner. Purpose of index fittings is to position tooling holes

avoids an excess accumulation of detail strip templets, especially for settings that are not to be duplicated on other fixtures.

The *station fitting* secures the vertical straight edge to the longitudinal straight edge. This is the first operation in a dock set-up. The fittings are positioned by means of a strip templet by inserting ground pins in the station holes in the templet to engage the bushed holes in the station fittings. The fitting is then locked in place by tightening the T-bolt which clamps it to the straight edge. Using the same set of strip templets successively on each of the four longitudinal straight edges, station fittings are located in a transverse plane. The vertical straight edges are then moved by crane to the station plane and are located by ground pins which pass through the holes in the station fittings into bushed holes in each end of the straight edges. A jack screw under each vertical straight edge takes the weight off the longitudinal straight edge.

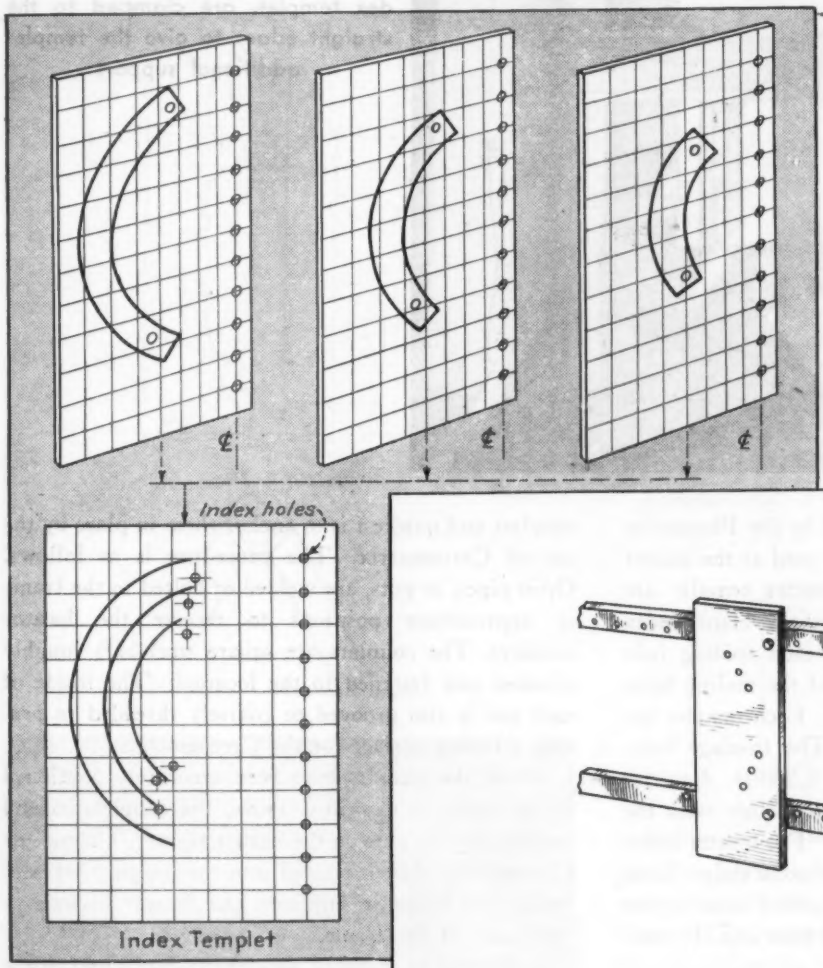
After the vertical straight edges are positioned, the next step is to locate the transverse straight edges on them at the desired water line readings. Here again strip templets, or adjustable set bars, are employed using ground pins in the bushed holes to obtain accurate settings. Holes at either end of the transverse straight edge are so located that their centers are on the centerline of the horizontal reference surface, which makes it simple to complete the setting without any calculation or allowance for offset. No station fittings are required with the transverse straight edges since they are clamped directly to the vertical straight edges with T-bolts.

The *dummy fitting* is used to position fixture locators from the transverse straight edge. It consists of a standard body, with a shoulder to fit the corner of the straight edge, and a clevis designed to mate with the machined fixture fittings. A cross hole through the clevis is located on the centerline of the face of the dummy fitting that rests on the reference surface of the straight edge; it is accurately spaced (usually 2.000 in.) from the shoulder.

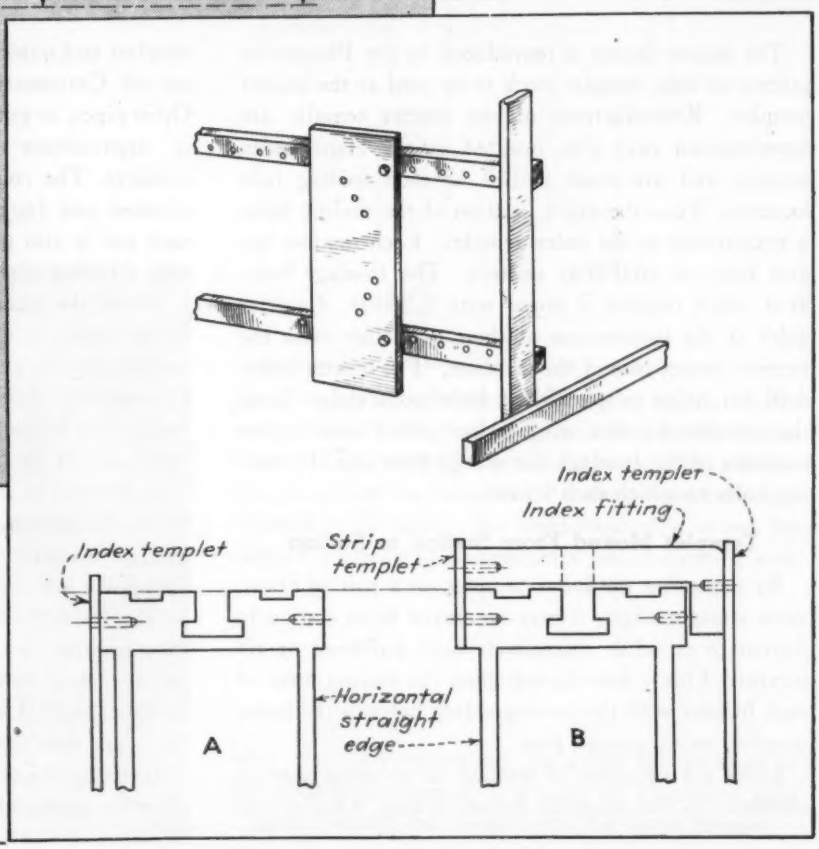
Dummy fittings are spaced along the transverse straight edge by means of strip templets (or adjustable set bars). They can then be used to position male or female fixture fittings, thus obtaining the third point in space.

The *index fitting* is somewhat similar to the dummy fitting and is located on the transverse straight edge in the same manner. Its purpose is to position tooling holes, particularly those in index templets. Instead of the clevis found on the dummy fitting, the index fitting has an accurately machined pin hole that centers on the reference surface of the straight edge.

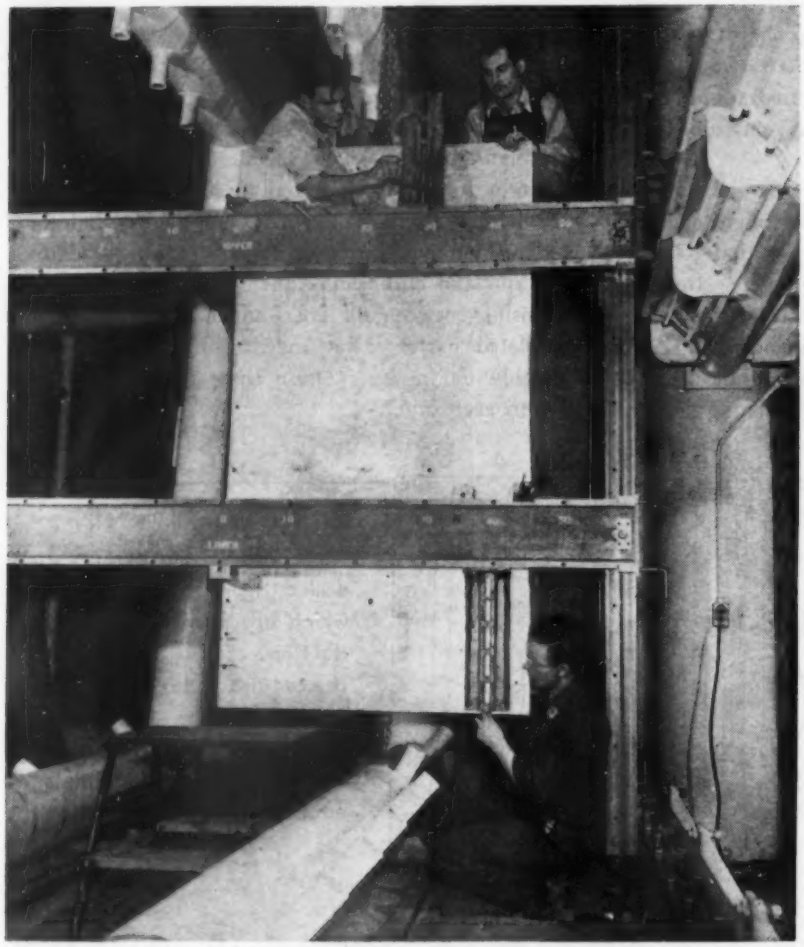
The *index templet* is a means of positioning fixture locators, especially those for fuselage bulkheads and wing ribs. The relation of these to each other establishes the aerodynamic contours of the airplane. The index templet is made of ⅛-in. sheet steel from loft information on the master layout. It is common practice to locate two or more tooling holes in the primary part of each assembly layout. These tooling holes are used in blanking, forming and subassembly of individual ribs and bulkheads, thus establishing a fixed relationship between the holes and the contours of the completed parts. They may again be used in the assembly tooling to position these parts in relationship to each other.



The index templet is stack drilled from master templets which are photographic reproductions of the master layout. It contains index holes on the airplane center line and the tooling holes which are needed to locate working templets at each station of the assembly fixture



Index templets may be attached directly to the transverse straight edges, as at A, or to the index fitting as an intermediate connector, as at B. Since the locating holes on the fitting are on the centerline of the reference surface of the straight edge, no allowance for offset is needed



The index templet is positioned on the transverse straight edges by dowel pinning to the index fittings. Angle blocks, located from the index templet, are clamped to the straight edges to give the templet additional support

The master layout is reproduced by the Photoprint process on steel templet stock to be used as the master templet. Reproductions of the master templet are superimposed over pins inserted in the blank index templet and are stack drilled at each tooling hole location. Thus the exact location of the tooling holes is transferred to the index templet. Each templet has grid lines on 10.000-in. centers. The fuselage bulkhead index templet is bored with 0.500-in. diameter holes at the intersection of these grid lines with the vertical center line of the airplane. The master index drill bar helps to space these holes accurately. Thus the completed index templet has nested upon it the contours of the fuselage (or wing) plan and the tooling holes to which each relates.

Templet Moved From Station to Station

By mounting the index templet on a pair of transverse straight edges, it may be moved from station to station to establish successively each bulkhead or rib locator. This is done by watching the tooling holes of each locator with the corresponding holes in the index templet, using ground pins.

There are a number of methods of securing locating elements to the assembly fixture frame. One of the simplest and quickest is to anchor them in place by the use of Cerromatrix. The procedure is as follows. Open pipes, or pots, are welded or bolted to the frame in approximate positions to receive the locator couplers. The couplers are square steel bars roughly grooved and fastened to the locators. The inside of each pot is also grooved or coarsely threaded to provide a keying surface for the Cerromatrix.

When the locators have been accurately positioned in the dock, as described above, the couplers extend loosely into the pots on the fixture frame. The molten Cerromatrix is then poured into the opening between them, and when it solidifies, the locator becomes a rigid part of the frame.

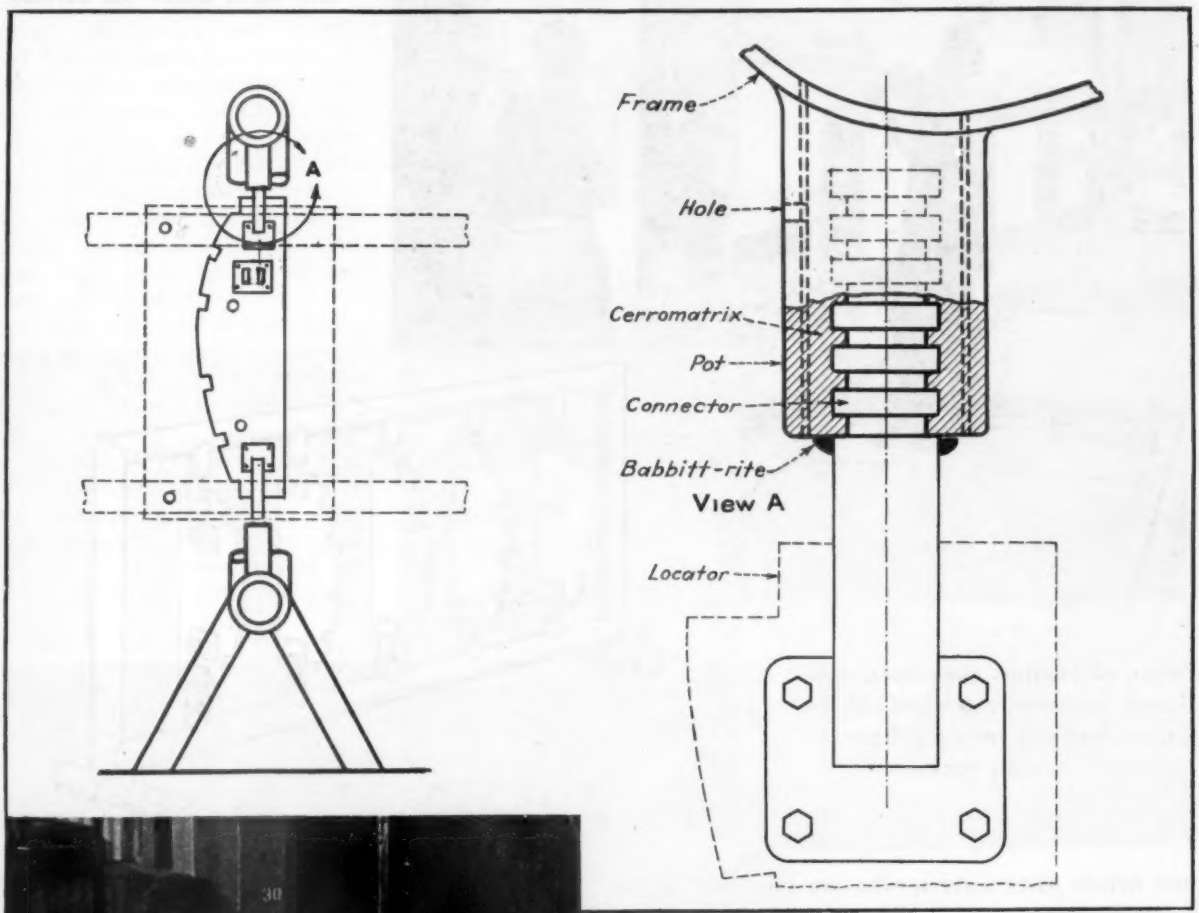
In the case of inverted pots on the upper part of the frame the opening may be sealed with Babbitt-rite or similar material. Then the Cerromatrix is poured through a hole in the side of the pot where it is held by the Babbitt-rite until it freezes. Steel dowels are then inserted to insure against subsequent movement. An advantage in the use of Cerromatrix is that it can be easily melted with a torch to free the coupling in the event that the fixture must be modified.

In using the dock, the fixture frame is moved into place by means of the overhead hoists. The frame is

set on locating dollies which rest on the dock loading rails. These dollies are adjustable vertically and laterally so the frame may be approximately positioned in the working bay. The frame is located in reference to the centerline of the dock and trued with the adjustable plumb bars on the dolly. Because of the generous clearance between the locator couplers and the pots only a rough setting of the frame is required. In performing these steps, workmen follow a dock set-up diagram prepared by tool engineers.

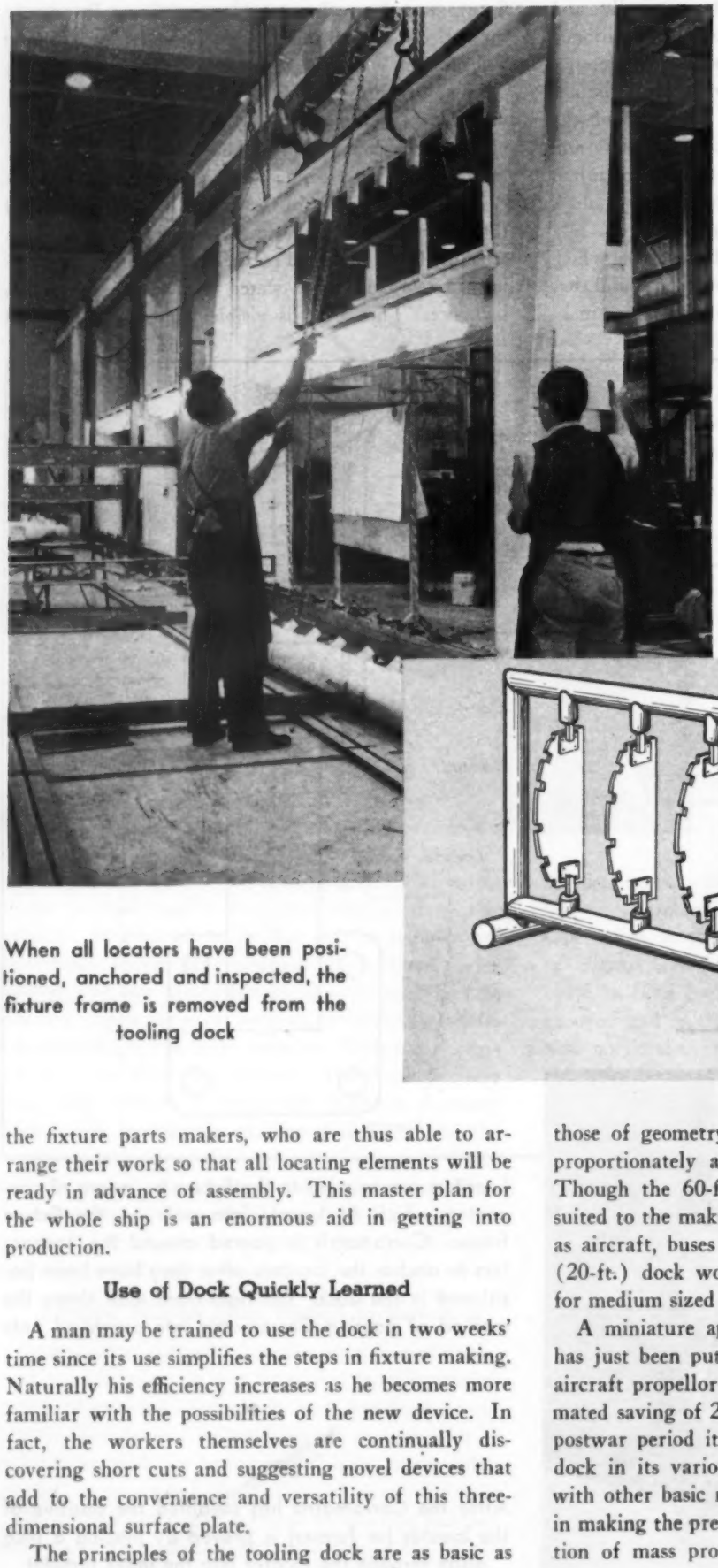
Adjacent to the dock are work benches on which fixture elements are fabricated. It has been found that the use of the dock tends to functionalize fixture making by separating the cutting of locators and other fixture parts from the assembly operations. Previously the entire job of building a fixture was turned over to a lead man who employed the men first in making parts and then in assembly. The specialization resulting from the use of the dock has in itself effected pronounced economies over and above the time saved in positioning locators.

The tooling program for a new model is scheduled through the dock by the production control group. A schedule board mounted on the dock shows the fixtures in progress and those slated to take their turn in sequence. The board is visible from the benches of

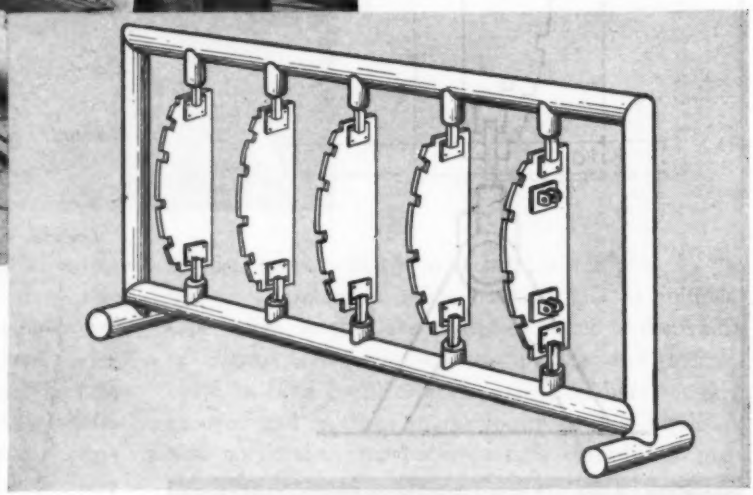


Locators are coupled to the fixture by means of connectors which fit loosely into pots on the fixture frame. Cerromatrix is poured around the connectors to anchor the locators after they have been positioned in the dock. The right-hand view shows the method of pouring Cerromatrix into overhead pots

After the Cerromatrix has solidified the positive of the locator (or former) is proved by placing a plug gage through the locator into the index templet



The fixture frame is moved into the working bay of the tooling dock by means of an overhead hoist. Note the built-in fluorescent lights under the catwalk



When all locators have been positioned, anchored and inspected, the fixture frame is removed from the tooling dock

the fixture parts makers, who are thus able to arrange their work so that all locating elements will be ready in advance of assembly. This master plan for the whole ship is an enormous aid in getting into production.

Use of Dock Quickly Learned

A man may be trained to use the dock in two weeks' time since its use simplifies the steps in fixture making. Naturally his efficiency increases as he becomes more familiar with the possibilities of the new device. In fact, the workers themselves are continually discovering short cuts and suggesting novel devices that add to the convenience and versatility of this three-dimensional surface plate.

The principles of the tooling dock are as basic as those of geometry, and its practical applications are proportionately as wide in three-dimensional work. Though the 60-ft. dock at San Diego is primarily suited to the making of fixtures for large objects such as aircraft, buses and streamlined trains, the smaller (20-ft.) dock would lend itself to assembly tooling for medium sized objects such as automobiles.

A miniature apparatus built on "dock" principles has just been put into operation in one of the large aircraft propellor plants for gaging blades at an estimated saving of 250,000 man-hours per year. In the postwar period it is believed that the master tooling dock in its various forms, will take its place along with other basic machine tools and inspection devices in making the precision fixtures which are the foundation of mass production.

One Laboratory Inspects Gages for Lend-Lease

Procurement, inspection and shipment of gages to Allied Nations is centered in the New York Ordnance District

ALL OF THE GAGES sent to the United Nations under Lend-Lease are purchased by the gage section of the New York Ordnance District and, with the exception of those going to the United Kingdom, inspected and prepared for shipment in its laboratory. While gages destined for the United Kingdom are procured through this division, they go to Canada for inspection and shipment.

In an airy, well lighted office building floor formerly occupied by a financial institution, the gage section of the New York Ordnance District has groups of employees analyzing equipment and skills of gage manufacturers' facilities, aiding manufacturers of ordnance material in expediting their gage procurements, counseling gage manufacturers in production and engineering problems, procuring gages and maintaining property records of all ordnance gages and instruments within its jurisdiction. In the adjoining spacious, fluorescent-lighted laboratory, employees carry on inspection and maintenance of equipment.

Inspection work is divided among checkers in accordance with the ability of each to handle specific types of gages and to follow various methods of inspection. Each inspection is reviewed by the gage leader, and periodic spot checks made of actual measurements taken by each checker.

All measuring instruments are calibrated and rechecked weekly. At intervals determined by actual use, master gages, such as gage blocks, are sent to the Bureau of Standards, Washington, or to the Cleveland Ordnance District, for recalibration.

Temperature Controlled

Gages made to tolerances of 0.0001 in. per in. of length, or smaller, are measured in a constant-temperature room for which the air is cooled, filtered and de-humidified. Gages to be measured are left in this room long enough for the total mass of each to become stabilized at 68 F.—the international measuring temperature.

Standard equipment of the laboratory includes super-micrometers, dial bore gages, surface plates, Bausch & Lomb projector and snap gage setting fixtures. Inspection is rechecked by supervisor before shipment is allowed

Working in the constant-temperature room, a member of the staff uses a Pratt & Whitney 48-in. measuring machine to check the pitch diameter of a thread plug gage for a 155-mm. breech block carrier

Precautions are taken to prevent body temperature affecting either the gage or the measuring instruments, by the use of insulating holding devices. The number of persons who may be in the room at one time during periods of use is limited, lest their body temperature affect that of the room.

For measurements coarser than those tolerances checked in the constant-temperature room, the normal precautions of a well-ventilated place with uniform temperature and without air currents are considered sufficient.

Special Packaging Designed

Despite the multiplicity of types and sizes of gages necessary to the ordnance program, standard size packaging containers have been developed. Where overseas shipments are involved, special provisions are made to insure protection of equipment from the effects of extreme variations in atmospheric conditions, as well as from possible exposure to rain and salt spray.

When inspection of a gage is completed and it is ready for shipment abroad, it is cleaned with Stoddard's solvent containing fingerprint neutralizer and light oil inhibitor, and dried. After this it is dipped in a corrosion preventive at 125 F. and wrapped in grease-proof, anti-corrosive paper, then in anti-corrosive, wax-impregnated cloth bearing identifying letters and numerals. The paper- and cloth-wrapped package is then dipped in a wax sealing compound at 175 F., through which the identification marks are readily discernible. After the wax has hardened, it is packed in a corrugated paper carton padded with cellulose wadding and the carton inserted in a wooden case lined with asphalt-impregnated corded paper.

Designs Gages

Not only does this section procure and inspect gages for Lend-Lease, but it also designs, procures and checks those for Ordnance Department use in the New York District.

Should a change in the manufacturing process of an ordnance compound require the use of a new type gage, the section will design one, or redesign an existing one to meet the need.

In some instances, one of the 13 ordnance districts may need a type of gage for which productive capacity is available in another district. Then the order is transmitted through the Office of the Chief of Ordnance to that district office, where procurement, inspection and shipment are carried on in the routine manner.

A checker inspects a flush pin gage on a Pratt & Whitney "Electro-limit" external comparator, using Pratt & Whitney "Hoke" gage blocks. Work is assigned trainees in accordance with developed ability

Gages in use by inspectors in the district are recalled for periodic check, depending upon wear life and production factors. Any corrections found to be necessary are made under the same routine that would be followed in arranging modification of a gage by a manufacturer. After inspection and correction have been completed, the gages are returned to the unit of the ordnance district organization from which it came, accompanied by recommendations as to the number of passes which can be made by it before reinspection is necessary.

Personnel Newly Trained

Of the total number of employees in the checking laboratory—75 percent of whom are women—only two had even seen a gage before the United States entered this war; the rest have been trained in the work through the education program developed by the Chief of Ordnance.

All of the girls are high school graduates—a majority have college degrees based on majors in such exact sciences as mathematics, physics or chemistry. Each was selected for mechanical comprehension and aptitudes.

It has been found that a trainee can check certain types of simple gages after three or four months in the laboratory. Thereafter she undergoes a progression of training to higher degrees, until she shows proficiency to check reliability to accuracy of 0.000,-000,1 or better.

During the training period, the neophyte is instructed in all phases of laboratory work, from packaging and gage handling, through inspection, design, to (possible) manufacture.

To supplement the detailed instruction given trainees, the chief of the laboratory gives half-hour lectures on the broader aspects of gage inspection, as well as bringing new developments to the attention of all personnel.

And such are the steps by which a program of precision, carried on in a skyscraper in New York's financial district, assures perfect fits to various pieces of material produced by the various Allied Nations.

Magnesium Sheet Easily Formed When Simple Precautions Are Observed

BY W. G. HARVEY AND J. B. WEST, AMERICAN MAGNESIUM CORPORATION

Five factors affect workability of magnesium-alloy sheet. When proper attention is paid to them the fabricator of aircraft parts should have little difficulty in forming the material

PRODUCTION OF MAGNESIUM in the United States has expanded 100-fold since 1938. Many fabricating plants are now using the metal in the form of sheet, extrusions and tubing. Some aspects of forming magnesium alloys, particularly deep drawing, are still somewhat experimental. But in general, forming practices have been developed to the point where the fabricator with no experience in handling the material may approach a production problem without fear.

It is not difficult to form magnesium alloy sheet. Recognition is required, however, of the limiting factors in the working of magnesium and making proper allowance for them in design of the parts. With the exception of heating equipment, conventional machines and tools are used, and workers adapt themselves quickly to handling the metal.

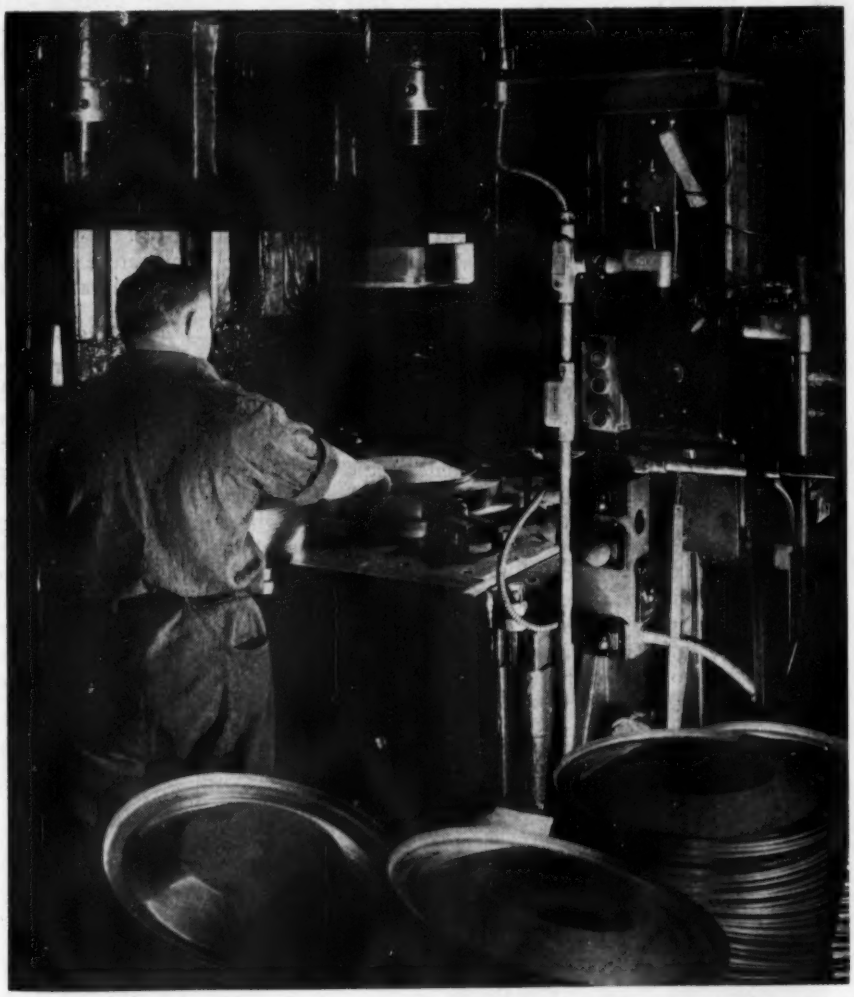
Most magnesium alloys are readily worked into intricate shapes at elevated temperatures, particularly in the region of 600 F. When formed at room temperature, magnesium alloys work-harden rapidly. They do not respond well in any temper to severe cold-forming operations.

The factors that affect workability of magnesium-alloy sheet may be summarized as follows:

1. Magnesium alloys must be heated to withstand severe bends, deep drawing, spinning, and other relatively difficult forming operations.

2. Thin sheet, heated for forming, may cool rapidly during forming.

3. In many cases, when cold forming magnesium alloys, greater springback may be experienced than with aluminum.



Cold drawing magnesium-alloy sheet is permissible if the reduction is not appreciable, usually 15-20 percent as a maximum. Here covers are being stamped for aircraft wheel brakes

4. The capacity of magnesium alloys for cold working is far less than that for comparable aluminum alloys. This peculiarity arises from the smaller differences between properties of the metal in the soft and hardworked conditions and the greater rapidity of work hardening.

5. Unlike high-strength aluminum alloys, the wrought magnesium alloys generally subjected to forming operations are not susceptible to heat-treatment.

When maximum properties are desired in the finished product, the sheets are generally worked in the hardest combination of alloy and temper that will consistently withstand the forming operation. Where the strength of the product is unimportant, the most formable combination is employed.

In general, AM-C52S alloy has better forming characteristics than AM3S and AM-C57S alloys. Other alloys, such as AM-C58S and AM59S, can be bent and formed only with dif-

ficulty, but their use in formed parts may be satisfactory in specific cases.

Workability of the sheet alloys—AM3S, AM-C52S, and AM-C57S—also varies greatly with the temper in which they are finished—annealed, hard-rolled, or hot-rolled, designated by the suffixes, O, H, and R respectively. Bending and forming properties of annealed sheet are greatly superior to those of hard-rolled sheet; those of hot-rolled material (R) are intermediate between those of the O and H tempers.

Some variations of workability can be expected, depending on the form of the alloy. For example, AM3S alloy develops different mechanical properties in sheet, extruded shapes and tubing.

Best working temperatures for hot-forming the three grades of magnesium alloy sheet are: 650 F. for AM3S, 600 F. for AM-C52S and AM-C57S, with an approximate range of plus or minus 50 F. Temperatures down to 350 F. may be used for more moderate forming operations to minimize the loss of yield strength caused by heating. If the material is formed at 800 F. or higher, the "hot-short" range is encountered, grain-growth is promoted and cracking results.

Methods of heating the metal to forming temperature vary, depending on the operation, the quantities involved and shop conditions. They are:

1. Preheating in a portable furnace (heated by oil, gas or electricity) placed close to the forming tool.

2. A hot-air blower may be used to direct a stream of hot air on the sheet during forming.

3. Dies are heated by gas flames or 750-watt electric heating elements inserted into recesses. The preferred die temperature is 500 F.

4. Moderate preheating of the blank on a hot plate while the preceding blank is being formed.

5. Immersion in an oil bath of sufficiently high flash point.

6. Preheated, cast-aluminum blocks may be used for contact heating while hand-forming parts. Such blocks, suitably cored, are preheated to about 50 F. above the desired forming temperature. The blocks are placed on a steel table with a blow torch directed at the underside, thus maintaining the temperature of the blocks. A gas torch should be at hand to bring parts of light-gage sheet not in contact with the block up to temperature. Heavy-gage sheet should be suitably preheated.

7. For experimental work involving only a few pieces, the sheet may be preheated by a hand gas torch. This practice lacks positive temperature control essential for magnesium work, but experienced workers will soon learn to use this method satisfactorily.

When light-gage magnesium sheet has reached the working temperature, speedy handling is necessary because of the rapid rate of cooling. Thus, it is advisable to preheat about 50 to 100 F. above the desired forming temperature. Caution must be taken to work below 800 F., to avoid the hot-short range.

Several simple methods can be used to control the temperature of the magnesium part. Use of a contact pyrometer is especially recommended for severe forming work, where success depends on accuracy of temperature control.

Other methods suitable for less severe work are: (1) a mark made with blue carpenter's chalk will turn light brown or white at approximately the proper temperature; (2) yellow laundry soap turns dark brown at about 500 F; (3) a drop of 600W oil applied to the surface of the sheet will flash at the proper temperature.

Effects of Heating

In general, heating of soft-temper sheet, extruded shapes, or tubing to a temperature of 500 to 650 F. prior to forming will not appreciably change the room-temperature properties of the metal. But alloys containing over 8 percent aluminum lost ductility when held at this temperature range longer than ½ hr. Heating of the sheet alloys in the hard temper to the above temperatures practically restores the soft-temper properties. An exception is AM3S-H which may lose up to 10-15 percent of its yield strength when heated for not over a few minutes at 600 F. or for not over two hours at 500 F. Heating of hard-rolled sheet to 350 to 400 F. for short periods does not appreciably affect the properties of AM3S-H, but AM-C52S-H and AM-C57S-H suffer a loss of about 10-20 percent in yield strength.

The minimum cold-bending radius for magnesium sheet must be determined by trial. The minimum radius varies with alloy, temper, thickness, the type of bending equipment employed, the rate of bending, sheet temperature and the relation of the axis of the bend to the grain of the sheet. In making 90-deg. bends under job-shop conditions, a bending radius of $4t$ to $5t$ (t equals sheet thickness) may be considered as a guide for AM3S and AM-C52S alloys, while a bending radius of $5t$ to $6t$ may be required for AM-C57S alloy. These figures are based on sheet thicknesses of 0.040 to 0.064 in. but decrease for thinner material and increase for thicker material. Minimum bending radii should be at least doubled for magnesium alloys in the H temper.

In cold bending of extruded shapes, AM52S and AM-C52S alloys have been found most satisfactory, followed, in the order given, by AM3S, AM-C57S, AM57S, AM-C74S, AM58S, and AM59S.

In hot bending, the minimum bend

Magnesium-alloy sheet can be spun to difficult shapes if the part is kept hot by a gas flame

radius is about 2*t* for sheet thickness of 0.040 to 0.064 in. The hot-bend characteristics of the various magnesium sheet alloys are practically the same.

When hot bending extruded shapes, the recommended temperature is 450 to 600 F. Heat does not appreciably affect the mechanical properties of the alloys, with the exception of decreasing elongation of AM59S to about 2 percent.

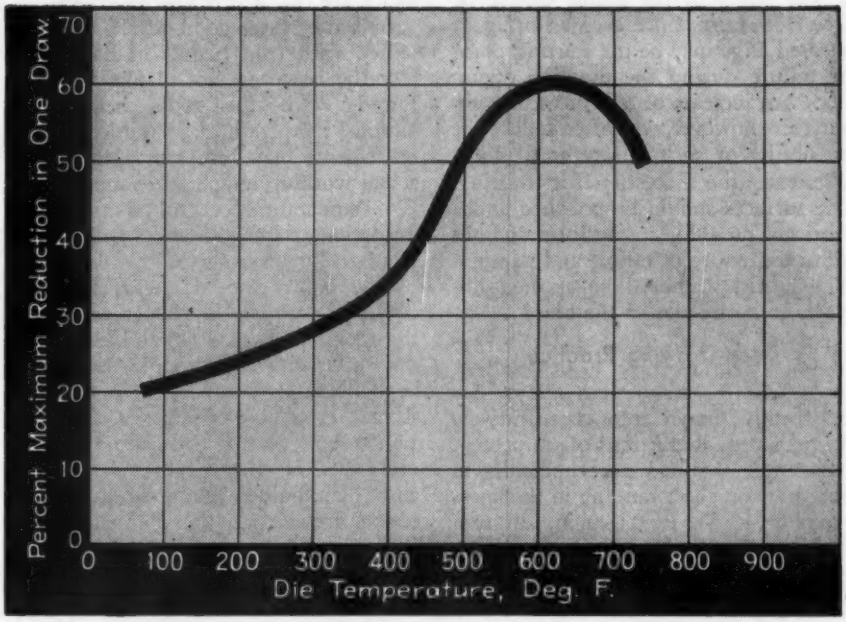
The bending characteristics of tubing depend on a number of factors, and it is difficult to predict the result of any given bending operation. In general, AM-C57S and AM-C52S alloys have bending characteristics superior to AM3S and can frequently be bent cold while AM3S requires heating for the same bend.

The severity of the bend and the quantities involved will determine the method of tube bending to be used. Use of makeshift tools for small quantities may necessitate the bending of magnesium tubing at elevated temperatures, whereas the same bend could be made satisfactorily at room temperature if properly designed steel tools and a mandrel were employed. On difficult bends, steel tools prevent collapsing of the outer radius. For example, ¾-in. O.D., AM-C57S alloy tubing with 0.032 in. wall may be bent at room temperature to 1½ in. mean bending radius with steel tools, but cannot be bent to this radius, even at elevated temperatures, with wooden tools. On the other hand, the AM3S alloy cannot be bent to this radius in 0.032 in. wall with steel tools even at elevated temperatures.

Hand forming, with the help of wood, cast-aluminum or magnesium forms, may be employed if sheet parts are required in small quantities or the contour does not lend itself to drawing. Wood, rawhide, fiber or rubber-composition mallets may be used for working the metal.

The best results are obtained in hand forming through the use of cast-aluminum forms and back-up blocks. The aluminum forms are quickly heated, easily maintained at a uniform temperature, and readily machined to desired contour. Wooden forms are satisfactory if the number of pieces is small and accurate dimensional control is not required. A mixture of one pound Alcoa Albron aluminum powder No. 552 per gallon of silicate of soda, painted on the wooden forms, is recommended to prevent charring at the working temperature of about 600 F. Water may be used to thin this mixture to brushing consistency.

A drop hammer can be used to form AM3S and AM-C52S alloys if they are heated to the recommended working temperature. Actual trial will determine how much deformation the sheet can withstand in one blow. It may be necessary to subdivide the operation and re-heat once or twice. The customary lead and zinc dies can be used for magnesium and should be held at a temperature of about 200 to 250 F.



Experimental Deep Drawing of Magnesium Alloy Sheet

$$\text{Percent reduction} = \frac{\text{blank diameter} - \text{punch diameter}}{\text{blank diameter}} \times 100$$

Equipment—double-acting toggle press

Spinning Is Done Hot

Magnesium alloy sheet can be spun if the part is kept hot while being worked. Cold spinning is limited to small amounts of forming. The temperature should be held in the range of 450 to 600 F. with a gas torch. There is little danger of overheating the sheet because of its rapid rotation. A speed of 300 to 450 r.p.m. in spinning circles of 15 to 25 in. in diameter is recommended, depending upon severity of deformation.

The number of spinning chucks, or number of reductions, depends on the shape of the finished product and on the ratio of blank diameter to the maximum diameter of the completed spinning. For example, by starting with an 0.032 in. thick by 36 in. diameter blank and using wooden chucks, parabolic propeller-spinner cowls of 16 in. depth and 24 in. base diameter have been produced, using six breakdown operations. Cast aluminum or magnesium chucks are recommended, but wooden chucks are satisfactory for small lots if given the heat-protecting treatment described.

Ordinary laundry soap is a satisfactory lubricant, but a mixture of two parts of mutton tallow and one part paraffin wax is preferred. Filing the edge of the sheet smooth before spinning will minimize edge cracks.

Press equipment used for drawing other metals, in particular aluminum, can be employed for magnesium alloys. From fully annealed sheet, comparatively shallow draws having fairly liberal radii can be made cold in one draw. The AM-C52S-0 alloy is best for this purpose. Maximum reduction in one cold draw is limited to about 20 percent. For AM-C57S-O sheet, maximum reduction in one draw should be limited to 15 percent.

The punch, die, and blank holder for cold draws may be of cast iron, since at room temperature magnesium draws are limited in severity and the metal will not withstand the loads which normally require the use of tool steel. Use of tool steel is justified, however, in the case of high-quantity production and elevated-temperature work. Because of the low modulus of elasticity of magnesium, specific allowance for springback must be made in design of the tools.

The radius on the die should not be less than four times and no more than 15 times the original thickness of the metal; the punch radius should be a minimum of four times the metal thickness. If the radius is too sharp, resistance to flow may cause the metal to fracture. If the radius is too large, wrinkling may occur in the side walls of the shell. When smaller corner radii are required in the finished article, they should be obtained by a second operation.

The edges of the blank should be free from burrs since even an ordinary sheared edge may be the starting point of failure during the drawing operation. An increase of tool or metal temperature, however, will often reduce the possibility of such failure and usually eliminate the necessity for burring. Die surfaces should be polished and a lubricant provided in the form of light oil or a mixture of tallow and paraffin. The lubricant should be applied liberally to both sides of the blank.

Deep-Drawing Practice

At 600 F., magnesium alloys may be readily drawn into comparatively deep shapes. Reductions of 60 percent have been obtained experimentally in one draw on sheet ranging in thickness from 0.040 in. to 0.090 in. In production, maximum reductions of 50 percent in one draw are being used.

An accompanying chart gives an idea of the reductions possible in magnesium alloy sheet at elevated temperature. The chart is based on strictly experimental work, and should be regarded as such. It will be seen that ductility of the magnesium alloys increases rapidly and almost proportionally with increased working temperatures, up to the "hot short" range which starts at about 800 F. Single draws of this type reflect both the increased elongation and the retention of strength at elevated temperatures, which are characteristic of the metal.

In some cases, good results are obtained with cold blanks in hot tools. Usually, however, hot blanks are preferred, with the tools heated to various temperatures. Production requirements may result in a range of actual working temperatures up to 700 F. Temperature control is aided by insulation of the die and blankholder from the main body of the press.

The punch should always be kept cool; this applies in particular to the thin gages such as 0.040 and less. Under no circumstances should the punch be deliberately heated. In some cases it may even be advisable to chill the punch by cooling with water or an air blast. Heating of the blank, die, and blankholder permits the work to be drawn into the die, while the cool punch against the center of the blank gives it the strength necessary to be pulled through the die.

For proper lubrication at elevated temperatures, the sheet should be immersed in a high-flash-point mineral oil, such as used for quenching or drawing, and maintained at 600 F. Beef tallow with a 20 percent admixture of graphite has also been found suitable.

Magnesium sheet, especially in alloys AM-C52S and AM3S, lends itself readily to rubber-die forming. Moderate draws can be made by the Guerin method. For hot forming, an electrically heated hot plate is used, on which the male die is mounted. Ordinary rubber is suitable for working temperatures of 250 to 300 F.

For higher temperatures, 400 to 450 F., heat-resisting synthetic rubber should be used for the platen, or if made of ordinary rubber, the platen should be protected by a blanket of heat-resistant synthetic rubber. The tendency of the rubber blanket to stick to the formed parts and to the hot plate is eliminated by sprinkling flaked mica between blanket, platen and magnesium parts.

Press brakes or roll forming machines may be employed to produce sections having thicknesses below those obtainable by the extrusion process. The limits of cold rolling depend largely upon the radii required and the amount of work put into the sheet. If the radii required are too small to permit cold forming, sections are produced at elevated temperature. In this case long pieces of sheet to be formed in a brake should be oven preheated.

Stress-corrosion cracking has occurred in AM-C57S, AM-C52S and other high-strength magnesium alloys subjected to high stresses over long periods. Magnesium-alloy parts formed at room temperature or at slightly elevated temperatures may have residual stresses which may lead to stress-corrosion cracking in some cases. In applications where a failure of this sort would have serious consequences, such parts should be given a low-temperature stress relief after forming. Heating for one or two hours at 300 F. is effective for this purpose; also for one hour at 400 F. The alloy AM3S is not susceptible to stress-corrosion cracking; so parts formed from it do not require a stress-relief treatment.

In blanking or punching magnesium sheet, the clearance between the die and the punching tool should be small. A clearance of about 5 percent of the sheet thickness is recommended. A 3-deg. taper on the punch is one way to improve the sheared surface. Slightly better sheared surfaces are obtained in AM3S alloy than in the other alloys. Plate may be sheared cold up to ½ in. thickness, but must be sawed when heavier.

The finish of the blank or sheared edge may be improved by heating the magnesium to 500 to 600 F. Magnesium stock expands during heating and allowance should be made for this in the dimensional layout.

Provided the metal is heated properly, ordinary shop equipment is adequate for fabrication of items such as magnesium oil tanks

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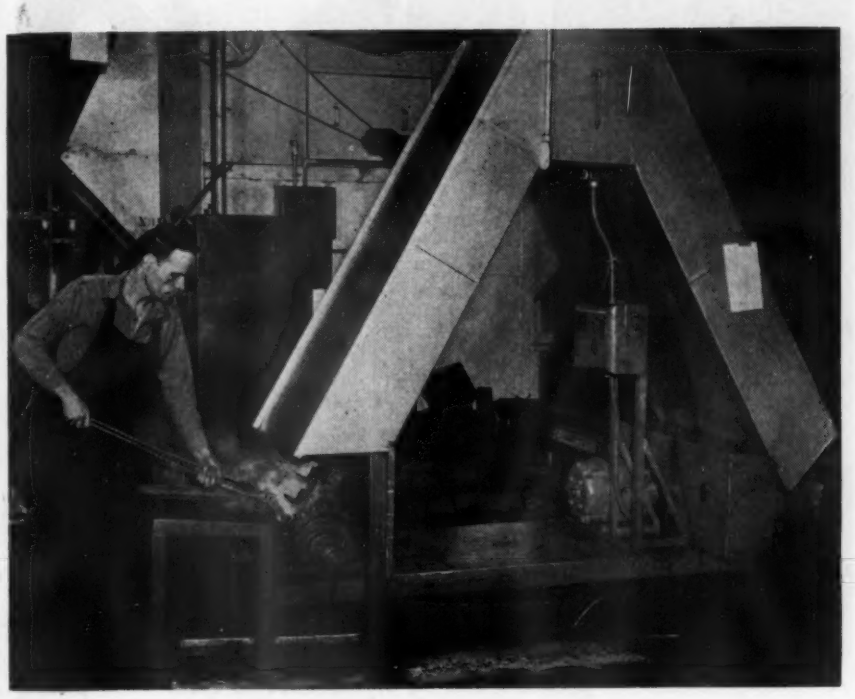
A second article, to be published in an early number, will discuss the application of these principles to forming an aircraft part.

Heat-Treating Accessories Improve Labor Relations



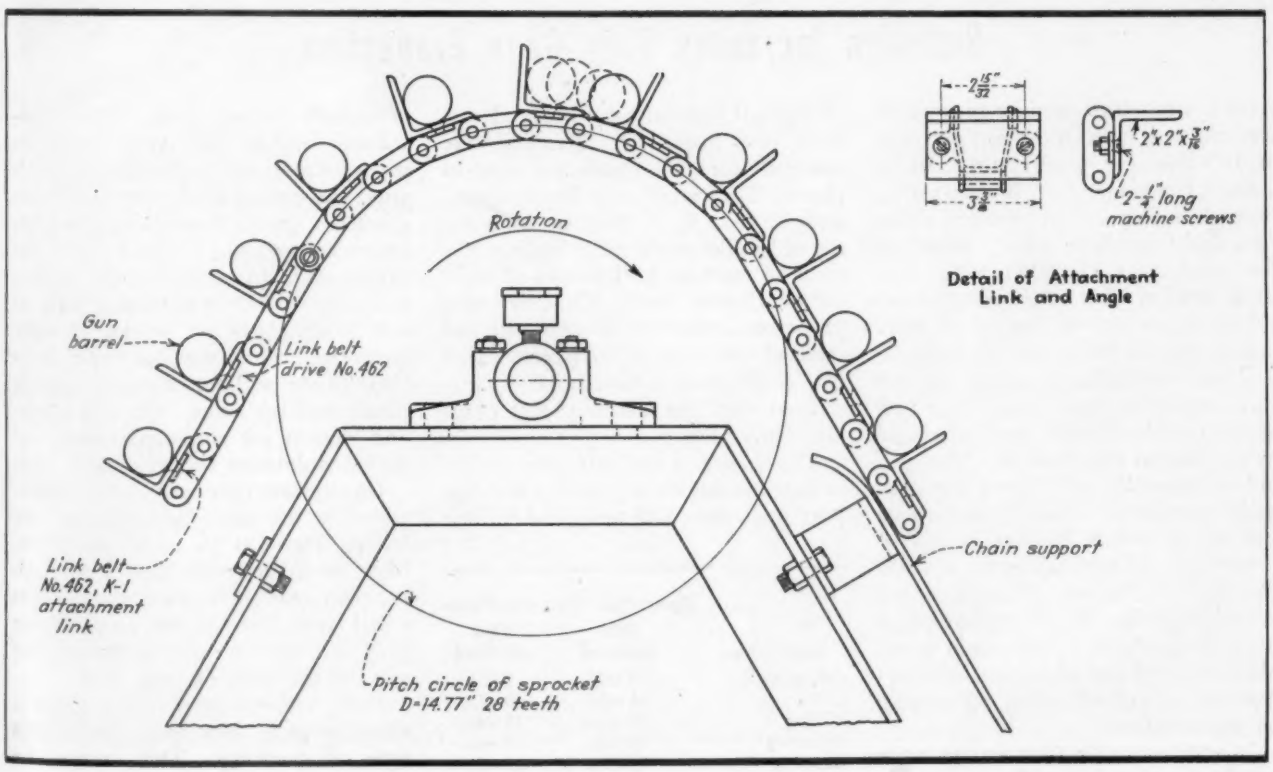
Compactness is achieved in the smoke ejector by causing the chain conveyor to follow a triangular path

AS MANY PEOPLE KNOW, the John Inglis Company, Ltd., Toronto, produces the Bren machine gun in large quantities for Empire troops. Because of the volume of work passing through a well-equipped heat-treating department, problems in labor relations and material handling were solved successfully by provision of certain devices by the Maintenance Department.

The Bren barrel is heat-treated and roller-die quenched on a continuous basis. Upon removal from the quenching machine, the bar retains sufficient heat to vaporize adhering oil. When stacked on skids, the "smoke" given off by the barrels was noxious to operators. This situation was overcome by design and installation of a "smoke ejector" by the Maintenance Department.

How "Smoke Ejector" Works

When the roller-die quenching machine lifts the barrel from the oil, the operator transfers the bar to the smoke ejector, which has a double chain conveyor fitted with attachment brackets.

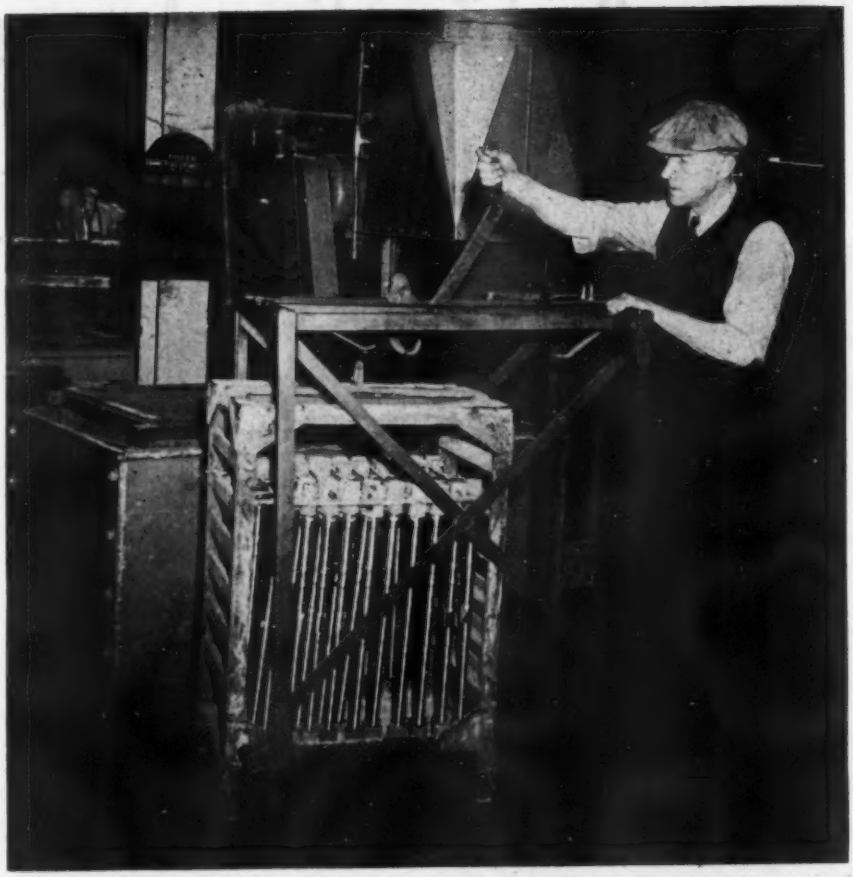


Barrels are transported safely on the conveyor chain by angle-iron brackets

The chain conveyor carries the bar upward and into one leg of an inverted V-shaped exhaust hood, then down the other leg of the hood in a period of about 15 min. During this time, the bar is cooled, and all smoke is exhausted from the department. In fact, the updraft is sufficient to remove the fumes given off from the bar while it is being transferred from the quenching machine.

Transports 1/2 Ton Safely

A wheeled truck that will lift loaded work racks weighing half a ton is proving a convenient means of transporting hot or cold work pieces from one operation to the next in the heat-treating department. The angle-iron rack is fitted with feet, has ledges upon which work trays can be positioned. When the rack is loaded, the wheeled truck is rolled over it, a hook is engaged with the lifting eye on the rack and the load is picked up by operating a handle. Leverage is sufficient so that the average operator can easily pick up the load. A safety catch, plus a self-locking feature of the linkage in the work-supporting position, prevents dropping the load. After the rack is wheeled to the desired position it is an easy matter to drop the load with complete safety to the operator.



A smooth, upward lift prevents shifting of the wheeled truck when picking up a loaded work rack weighing 1/2 ton

Redesign Increases Plug Gage Production

TIME REQUIRED to produce plug gages was reduced from 206 min. per gage to 132 min. per gage at the General Electric Company, Fort Wayne works, through a few design changes and a centralized handling plan. Based on the production of 8000 plugs and 2100 handles, this time reduction resulted in an annual saving of 8852 man-hours and 5028 machine hours.

Three major steps made possible this improved production. First, all gages for the works were produced by the general tool division. This permitted larger lots of a given size gage to be scheduled. Second, standardization on taper lock handles instead of screw lock handles allowed advance ordering of plugs as all members are interchangeable. Third, making plugs of a standardized length made possible turret and partial engine lathe operations instead of doing all turning on engine lathes.

In addition to the time savings made possible by these steps, changes in material specifications eliminated the use of critical materials and reduced material costs materially. Handles were changed from aluminum and steel to plastic. This saved 525 lb. of aluminum or 2625 lb. of steel on the quantity of handles produced. Plugs are now made of machine steel instead of high-carbon chrome steel. This effected a 92 percent reduction in steel cost and released two tons of high grade steel for other uses. Comparative tests showed that the machine steel plugs give longer life.

The change in methods also resulted in time economies in grinding and lapping operations and permitted the use of unskilled female help. The standardized lengths and large quantities allow inexperienced operators to rough grind the gaging dimension and finish grind the handle dimension, using experienced operators to finish grind the gaging end. In lapping plugs, output was increased from six and a half to nine plugs a day per person. Larger quantities make it possible to lap for a longer time without changing gaging blocks and lap rings. On this operation women are employed instead of skilled toolmakers formerly used.

Unnecessary time was likewise eliminated in the office by preparing one set of drawings to cover all plugs. Now when an order comes through for plug gages it is necessary only that a girl clerk insert in the proper space plug dimensions, shop order, request number and class of gage.

Now, too, all checking of plugs is done by girls who specialize in this type of checking. This carries the time and skilled labor saving through the complete manufacturing cycle.

	Operation Time per Piece	
Operation	Old Method	New Method
Office work	10 min.	5 min.
Lathe	36 min.	18 min.
Milling	18 min.	15 min.
Grinding	46 min.	27 min.
Lapping	84 min.	60 min.
Checking	12 min.	9 min.
TOTAL	206 min.	132 min.

Spindle Nose Ground After Assembly

IN ORDER to make certain that spindle noses on its line of engine lathes run true, the Axelson Manufacturing Company has devised a fixture through the use of which the surfaces on this member may be ground after the spindle has been assembled with the headstock. Axelson uses the standard spindle nose as approved by the National Machine Tool Builders' Association. This design has a conical surface to receive the center adapter and two flat surfaces at the end of the nose separated by a shallow external conical surface for seating the chuck. All these surfaces affect the accuracy of the work turned out by the lathe.

The arrangement for grinding the surfaces with the spindle in place consists of a modified Axelson 20-in. engine lathe bed complete with feed rod, gearbox, tool rests, and apron, but without the usual head and tailstock. The feed mechanism is driven by an independent gearmotor.

In place of the headstock, there is a heavy adapter plate which is pivoted to the lathe bed. This pivot is at the end of the plate toward the tail end of the bed, while at the opposite end of the plate is a protractor which reads directly in inches per foot of taper. The top of the adapter plate is provided with a V-way and a number of tapped holes which position and hold the headstock to be worked on.

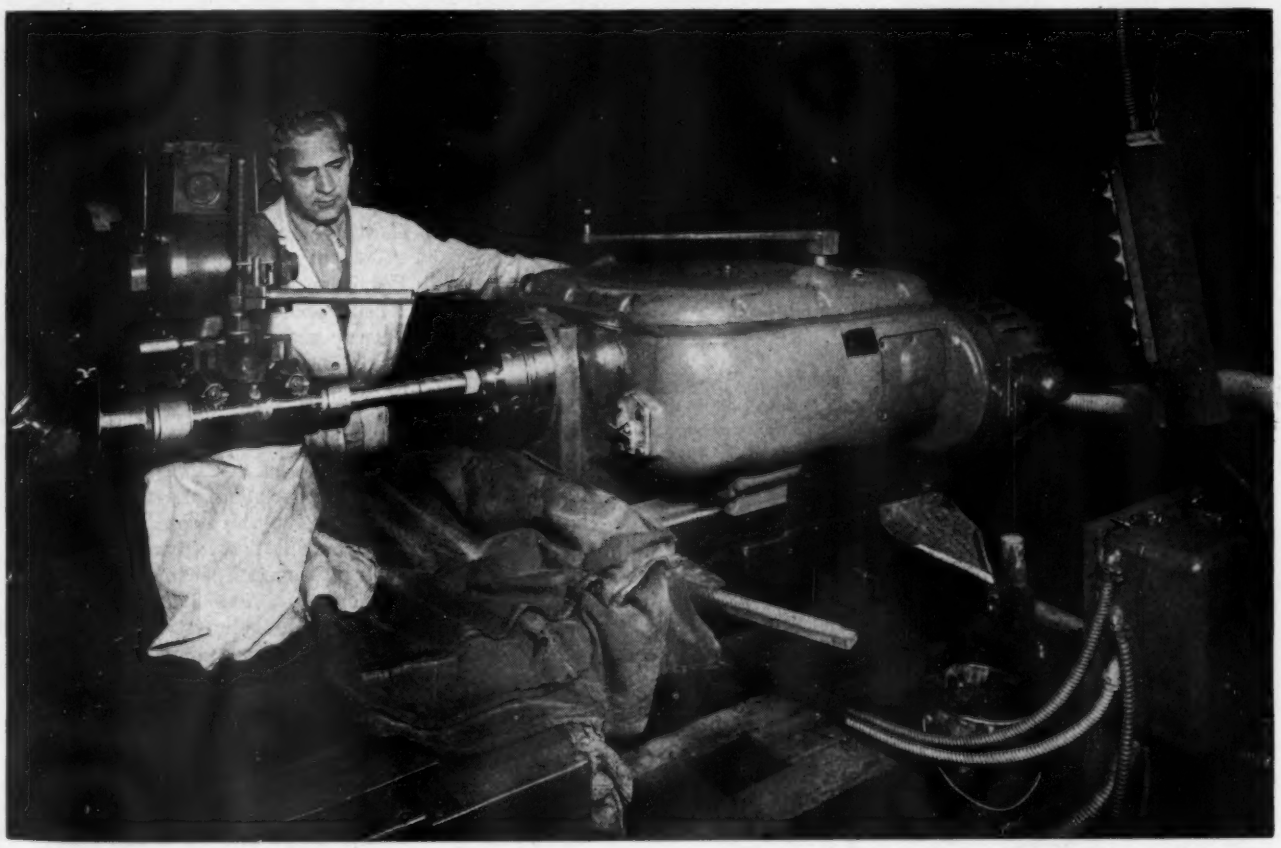
The tool rest of the lathe is equipped with a Dumore grinding head driven by a 1½ hp. motor rated at 3450 r.p.m. This is connected to the grinding spindle by a double V-belt which steps up the speed to a little over 4000 r.p.m. For grinding, a 4-in. wheel is used (American Standard B 601 S 7 6 V). A straight wheel is used for grinding the conical surfaces while a wheel bevelled to 45-deg. is used on the flat surfaces.

The procedure is to set the headstock with the spindle in place on the adapter which is arranged to take three sizes of headstock. For the flat surfaces, the bevelled grinding wheel is mounted on the spindle, and the grinding head is swivelled to 45 deg. so that the surface of the wheel is at right angles to the length of the bed. The wheel is trued in this position before being put to use. Using the crossfeed screw, the wheel can be traversed across the work to grind it to the dimensions desired.

For the conical surfaces, the entire headstock is swivelled to the desired angle using the protractor on the adapter plate for the purpose.

The straight grinding wheel is then employed for these surfaces using the regular longitudinal feed of the lathe. An adjusting screw on the side of the adapter plate makes it easy to obtain the desired angularity.

In order to protect the fixture, a dust collector is mounted on it when in use to draw the abrasive grains away, and the bed ways are covered with blankets. Using this device, the spindle nose surfaces are ground to ± 0.0003-in. These limits are checked with a dial indicator reading to tenths of thousands after final assembly.



A dial indicator is mounted on the bar extending from the grinding head, in order to check accuracy of grinding the spindle nose surfaces to the established tolerances of ± 0.0003 in.

Step Up Milling Efficiency By Using Fewer Cutter Teeth

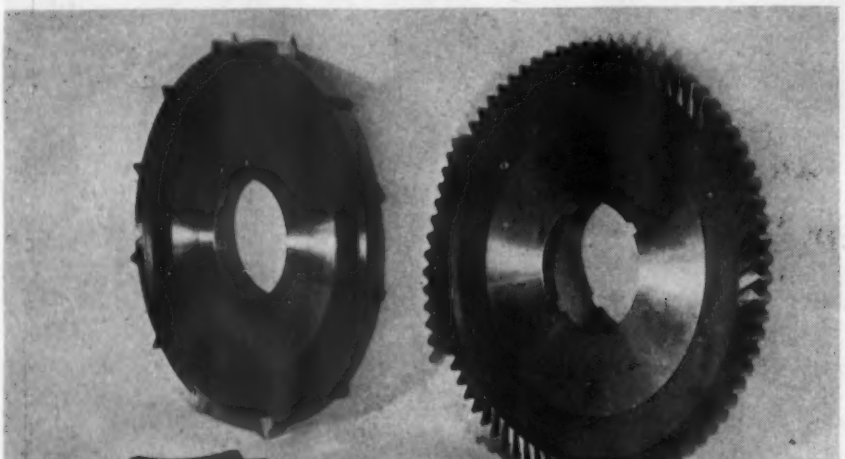
BY ARTHUR A. SCHWARTZ, CHIEF TOOL RESEARCH ENGINEER, BELL AIRCRAFT CORPORATION

This milling cutter was made up by rough machining a malleable iron casting and then brazing into position six non-ferrous cast blades. Rough surfaces of cutter body do not interfere with cutting action

Then take a heavier chip and cut faster so that the heat generated will be concentrated in the chips and got rid of before it has the chance to damage the tool or work

CONTRARY TO POPULAR BELIEF that the more teeth incorporated in the design of a milling cutter the greater its productive output, the writer is of the opinion that the most effective cutters are those having from one to six teeth.

In all machining operations the generated heat is the limiting factor in the speed of operation. So, to increase the speed of production we must first decrease the generation of heat in the part and in the tool, and we must increase the dissipation of heat so generated.



For reversed hobbing an hourglass worm, the blank ran at 59 r.p.m. and the 75-tooth cutter had a feed of 0.004 per revolution, to give one piece in 26 min. Finish was poor, six to eight pieces were obtained per grind. After removing all but 12 teeth, the blank was speeded up to 87 r.p.m., feed increased to 0.024 in. per revolution, giving one piece in four min. Finish was much better; at least 25 pieces per grind were obtained. Material: SAE 4130 heat-treated to 95,000 psi

Observation of any machining operation will disclose the fact that most of the generated heat is in the chips. If we watch a long, curling chip coming from a lathe we see that during normal operations this chip comes off the tool with its outside surface still at a natural color. The heat then rushes from the opposite side and the chip turns yellow, brown, purple or blue, depending on the cut being taken. It is apparent that the inner surface of the chip, the side that is compressed, is where most of the heat is generated and concentrated. Therefore, the quicker we can get rid of these chips the less chance there is for heat to enter the tool or the part.

In milling we can accomplish this by increasing the speed of the revolving cutter. This statement may be challenged by many good mechanics, as we have long been taught to believe that heat generated in a cutter is in proportion to the speed at which it is operated. This is true only if all other conditions remain proportional to the speed. Thus, if we increase the speed we also increase the number of chips cut per unit of time, and it is evident that to cut twelve chips instead of four generates more heat. But if we use a four-blade cutter instead of one with twelve blades and make the same number of chips, this old rule no longer holds. The actual cutting time will be reduced to one-third of the regular time as the blades will move three times as fast.

Also, the inactive time, the time during which the tool and the part are cooling, would be three times as long and the result would be an overall reduction of heat in the cutter and in the part. The generated heat will be concentrated more in the chips where we can readily dispose of it and where it does no harm.

With the four blades we can also increase the thickness of the individual chips by at least 50 percent, and in some cases feed may be increased 200 to 300 percent.

Too much emphasis cannot be put on the thickness of the individual chips. Theoretically, we can cut a chip 0.0002 in. thick but that would require a cutter blade with an edge as sharp as a good razor blade. In reality a good sharp cutter has an edge with about 0.0005 in. radius. In conventional milling each blade slides over the part until the pressure sinks it into the material deep enough to start a chip. Many times on our present multi-blade cutters one or more blades fail to come to the required pressure to "take a bite." Much heat is generated in the part and in the sliding blade, and this heat is concentrated in the cutting edge where it will do the most damage and in the part that is to be machined by the succeeding blade.

Measurements have not been made, but it is believed that the uselessly created heat of one sliding, non-cutting blade is much more than the heat developed by one blade cutting a normal chip. It is also believed that the difference between the heat imparted to the tool and the part by a blade cutting a thin shaving about 0.002 in. thick and a blade cutting a shaving of about 0.010 in. thickness is very slight.

Simple Cutter Recommended

Typical of a cutter with too many teeth is one which we recently purchased. It is an inserted-tooth shell end mill of approximately 15 in. diameter and has 60 teeth.

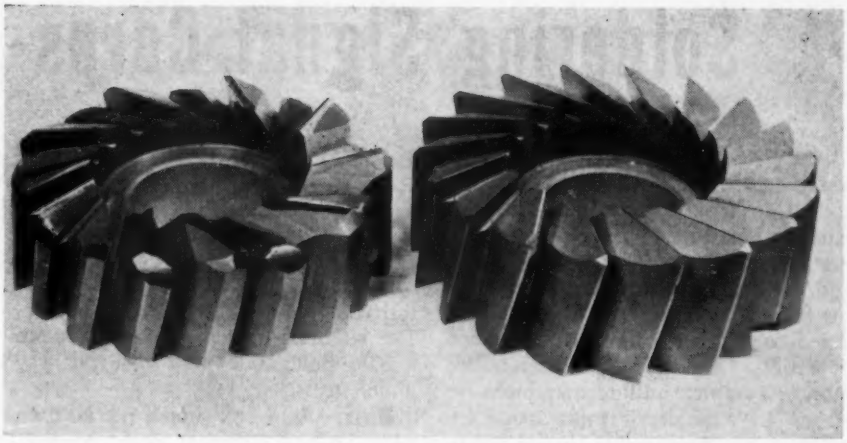
Let's see what actually happens to a cutter of this type when it reaches the shop. First, the cutter is used for surfacing a few bosses on a rather fragile forging. The cutter is run at about 50 r.p.m.; depth of cut varies from 1/16 to 5/16 in.; feed, a steady 2 in. per min. On the second job the cutter is used at about 100 r.p.m. It is taking a rough cut from 0 to 3/8 in. deep from an aluminum casting about 6 in. wide at a feed of 5¾ in. per min. In both of these operations the feed per tooth is well under 0.001 in. and the result is that many more teeth slip over the work than bite into it. This means that much heat is generated, blades are dulled and too much power is consumed.

Because of these facts, we recommend the use of simple milling cutters with one to six blades. If not available on the market, these cutters can be made with bodies of malleable iron, cast iron, Meehanite or mild steel with blades brazed on. We then have a choice of cutting material we want to use.

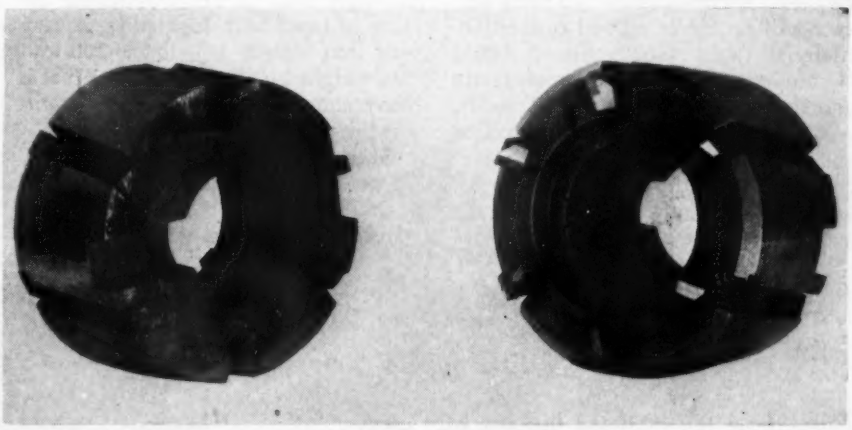
If high-speed steel is needed, we can build up a blade on the soft bodies with high-speed steel welding rod now available for that purpose. Thus, scarce high-speed steel is saved, as only enough is used to make the actual cutting blades, instead of the pounds required to make an entire cutter. We may also use any of the nonferrous alloys which can be brazed to the cutter bodies without danger of their tempers being drawn. Some of these alloys can be used at much higher speeds than high-speed steel.

A cemented-carbide blade may also be brazed on, although these are not recommended for milling cutters to be used on steel, or at speeds over 600 ft. per min., or where the available power is too low. Carbides are brittle and the interrupted cutting action of a milling cutter working on steel is apt to shatter the carbides at really high speeds. Carbides must have very little rake, if any, and they consume more power than other cutting material per pound of chips made.

One other important consideration in the use of malleable iron in cutter bodies, besides availability and ease of machining is the resistance of this material to vibration—it is almost as inert to vibration as lead. Too, malleable iron cutter bodies lower substantially high speed steel requirements.



After breaking one tooth in a conventional 16-tooth cutter, the cutting edge of every other tooth was ground back, and the set-up revised so that metal removal was increased four-fold and actual floor-to-floor time cut in half. The modified cutter was used thus on X 4130 steel of 70,000 psi. tensile: roughing cut—37 r.p.m., ¾ in. depth of cut, 0.950 in. feed per min.; finishing cut—47 r.p.m., 0.040 in. depth of cut, 1.47 in. feed per min. Pieces per grind, ten times previous performance



Slots were cut in the body of a worn-out high-speed cutter and six carbide-tipped lathe tools were brazed in the recesses. Good performance has been secured in end milling steel at a speed of 250 surface ft. per min. and a feed averaging 0.0015 in. per tooth. Approximately 30 hr. service is secured between grinds

Soldering Signal Corps Equipment

BY MILTON SALANT, INSPECTOR IN CHARGE,
NEWARK SIGNAL CORPS INSPECTION ZONE

RADIO and electrical equipment installed in tanks, trucks and bombers must be able to withstand constant vibration and shock. The most elaborate and expensively built piece of apparatus becomes worthless if a poorly soldered connection is made. Intermittent operation, "shorts," distortion, noise, hum or complete failure may often be traced to a soldered joint made by someone presumably insufficiently trained in soldering procedures. With the draft constantly depleting the ranks of expert assemblers, manufacturers are faced with the problem of training replacements. The following discussion is based on methods taught employees by leading radio producers.

Cleaning the Joint. Prior to soldering, the joint surfaces should be cleaned. A corroded or oxidized surface will not make a good connection. Materials that cannot be tinned should be roughened slightly with emery cloth, and they will then take solder readily.

Sound Joints. No connection should depend solely upon the solder bond for strength. Crimp wires to the terminal or wrap them around the terminal at least one turn. Do not disturb the joint while it is solidifying. The slightest movement will promote a poor bond, one that will give way under stress.

Flux. Acid flux should not be used on radio and electrical work. Aniline-phosphate flux or rosin flux are suitable, likewise rosin-core solder. A solution of rosin in alcohol, applied with a stiff bristle brush is ideal when a flux must be used.

Weight of Iron. Assembly-line production is commonly done with soldering irons rated at 75 to 150 watts. For grounding to a chassis, a 200-watt iron is often required because of rapid heat dissipation. A 120-watt iron weighs 1⅜ lb., a 200-watt iron weighs 2¼ lb. Use an iron that is heavy enough for the job without tiring the operator by constant use.

Shape of Iron. A long pointed tip radiates and wastes more heat than a short blunt tip. A blunt tip will transmit heat more rapidly to the work.

Soldering Technique. Hold the iron tip flat against the connection. The entire face of the tip should be applied to the work to avoid a "rosin joint." A rosin joint is caused by insufficient heat to melt the rosin and flux the work surface, and arises because the rosin forms a thin film between solder and connection. Touch the solder to the connection, not the iron. Melting solder on the iron tip dissipates the flux before it can clean the connection. Do not remove the iron before the solder flows freely. A good connection is made with a minimum of solder. Excess solder gives the appearance of a poor job, and "shorts" may be caused by spatters. Never reheat a connection without fluxing.

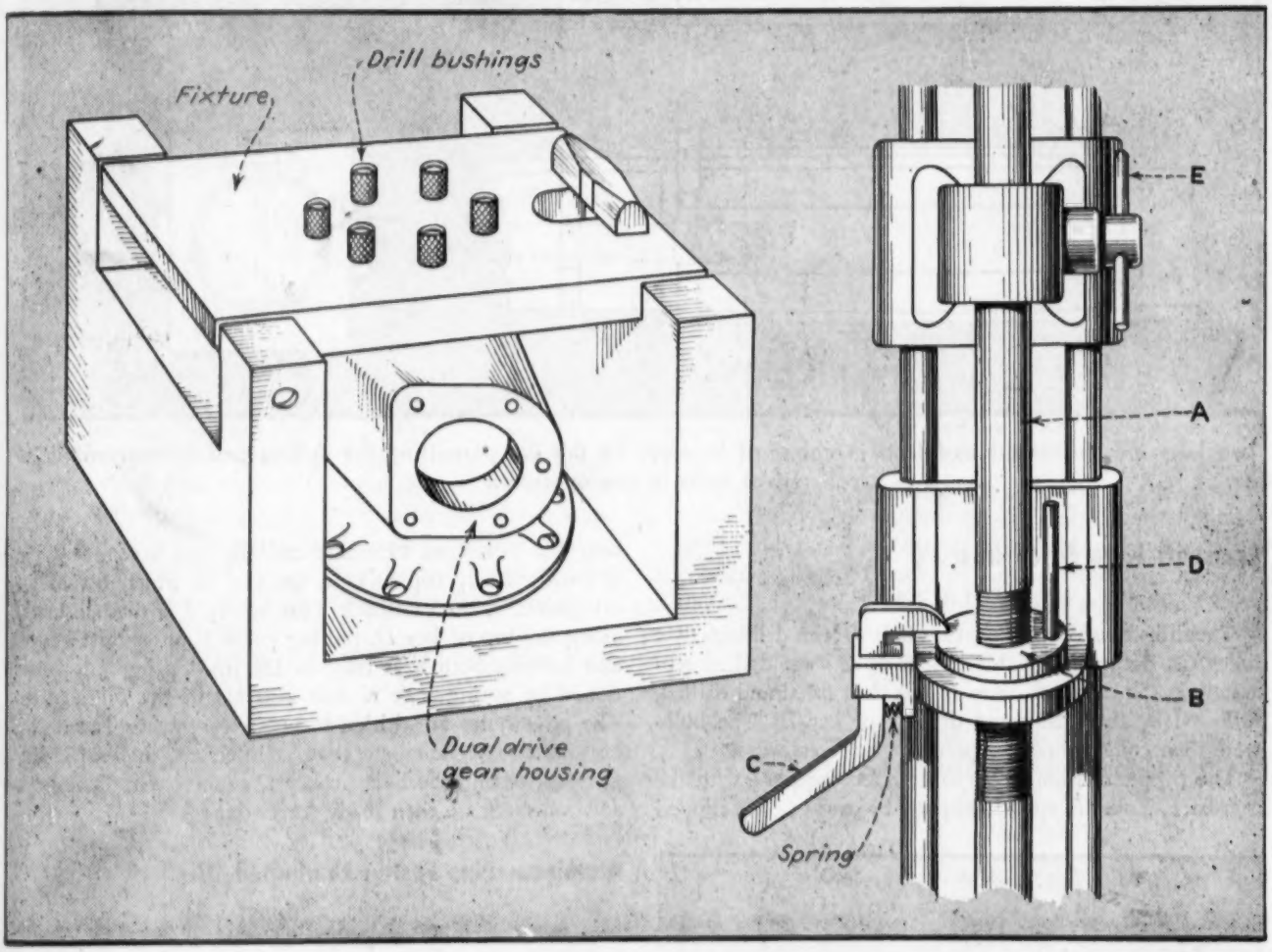
Precautions When Soldering. Work should be kept away from the operator's face to avoid injury from spattering and fumes. A light cotton glove will protect the hand against an accidental spatter and steaming flux.

Fumes from the soldering flux are kept away from the worker's face by a chimney arrangement. The iron is mounted in the chimney, its radiated heat creates a satisfactory updraft to remove the fumes

An assembler works faster and under less tiring conditions if the soldering iron is mounted upon a stand in an inclined position. The solder spool is held by a bracke under the table

Practical Ideas

War-Winning Suggestions appearing on these pages were selected from those recognized as meritorious by the Board for Individual Awards, War Production Drive. They are freely offered to industry as an aid to war production



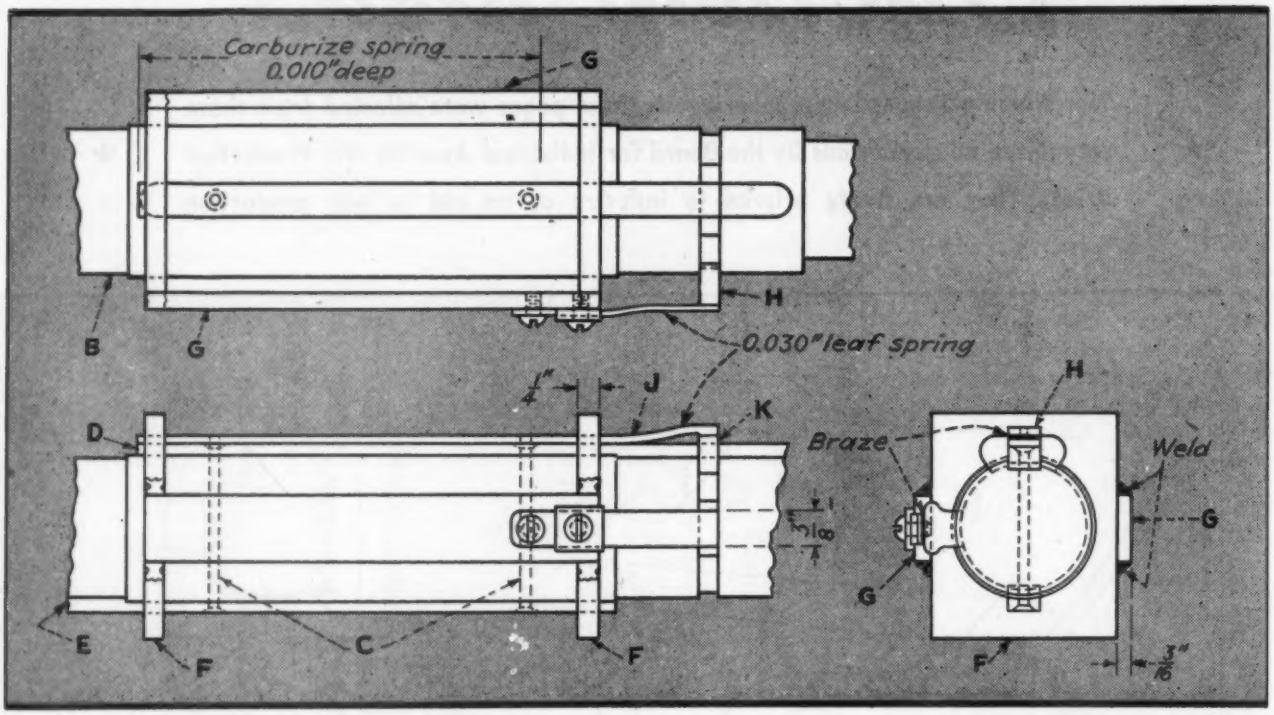
A hinged clamp and guide pin added to a machine tapper facilitates alignment of the tap and drilled hole, and minimizes tap breakage

Reduces Tool Breakage When Machine Tapping Holes

BY LAWRENCE TREESE
Packard Motor Car Company

Six accurately located holes have to be tapped in the dual-drive gear housing shown in the drawing. This was done previously by passing the tap through the jig bushings and into the drilled hole in the part by action of lead screw *A* and nut *B*. After tapping the first hole, an automatic switch stopped the spindle and reversed it. This reverse action was necessary until the tap cleared the bushing, when the machine was stopped and the tap lined up with the second hole. When starting the tap through the second or subsequent holes, however, the power of the spindle would break the tap unless it was aligned perfectly with the drilled hole.

To prevent such tap breakage, hinged clamp *C* and guide pin *D* were added to the tapping machine. Also, an automatic switch was added to shut off the machine as soon as the tap is backed out of the hole. The clamp is then released and the spindle raised so as to clear the bushings by means of hand lever *E*. In starting work on subsequent holes, the tap is lowered through the bushing by hand feed and adjustments made in alignment without breaking the tap. The clamp is then set again and the machine is ready to tap the hole. This saves about six taps and 24 man-hours a week. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



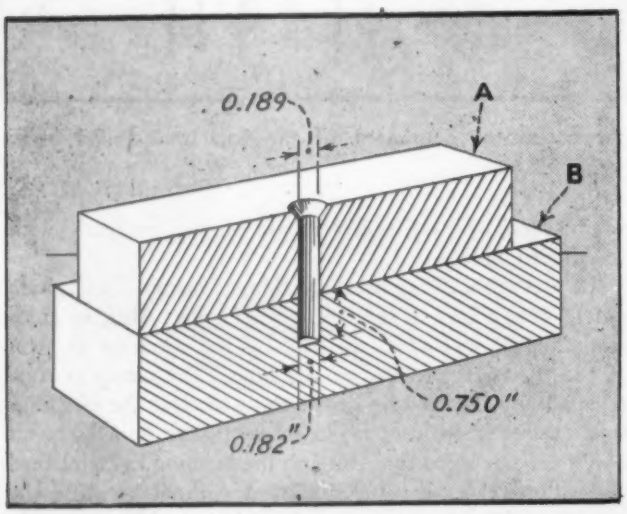
Two keys are positioned and held in camshaft keyways by this jig, permitting the drilling and countersinking of rivet holes in one operation

Camshaft Keys Fitted in a Jig

BY RALPH R. WAECH

The illustrated jig holds camshaft *B* for drilling rivet holes *C*. Before using this jig, holes *C* were drilled separately in the camshaft. Key *D* was then fitted and drilled, followed by the fitting and drilling of key *E*. The holes were then countersunk for peening the rivets.

The jig permits both keys to be fitted complete with the camshaft. Yokes *F*, spaced properly by straps *G*, are slipped over the assembled camshaft and the two keys. The jig is positioned by clip lock *H*, the clip of which fits in an oil groove in the camshaft. Leaf spring *J* is then inserted along the top of key *D*, pulling yokes *F* up against key *E* and holding both keys tight in the jig. Spring *J* is positioned by spring lock *K* that also fits in the oil groove. The rivet holes are drilled through leaf spring *J* and the camshaft. The holes are then countersunk in key *E*, the jig reversed and the holes in key *D* countersunk. The keys and camshaft are then ready for riveting.



Sections of laminated Masonite form dies can be fastened with aluminum rods. These prevent damage to machines when the dies are routed or sawed to shape

Aluminum Pins Fasten Laminated Dies

BY H. A. DURST
Douglas Aircraft Company

When making bulky laminated Masonite or fiber form dies, irregularities and curvatures make it difficult to clamp the pieces together. Screws and bolts are sometimes used instead of clamps, but when the dies have to be sawed or routed, they form a safety hazard. Instead of using these practices, we now fasten blocks of Masonite and other compositions together with aluminum pins. This practice enables the form-block and pattern makers to work without interruption on a large stretch die or form block, since there is no necessity for clamping it or waiting 24 hours for glue to set.

A hole is drilled and countersunk through part *A* of the laminated block, the hole being large enough to receive a 3/16 in. aluminum rod. The hole in part *B* is drilled 0.005 in. smaller and 0.750 in. deep. Glue is applied and the rod driven into place. The rod is then cut long enough to form a head in the countersunk hole. One sharp blow

forms the head, drawing the parts together and squeezing out excess glue.

This practice secures laminations with sufficient pressure to permit a good glue bond. It is not injurious to woodworking equipment when the rods are cut during shaping operations. Displacement bumps, hinges, clamps and fixtures can now be affixed readily to the form dies. The aluminum rods need only go into the blocks ¾ in., even when the die is 1 ft. or more thick, and weighs hundreds of pounds. *War Winning Suggestion from the Board for Individual Awards. War Production Drive.*

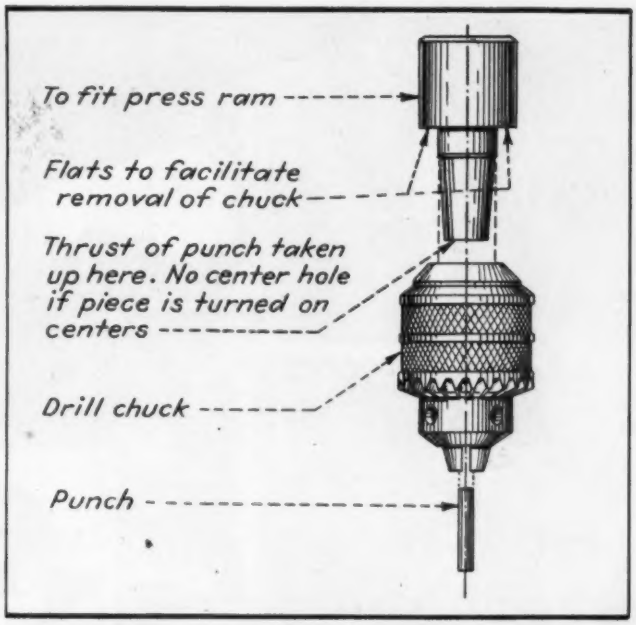
Drill Chuck Used as Punch Holder

BY F. W. COOK
Radio Manufacturing Engineers, Incorporated

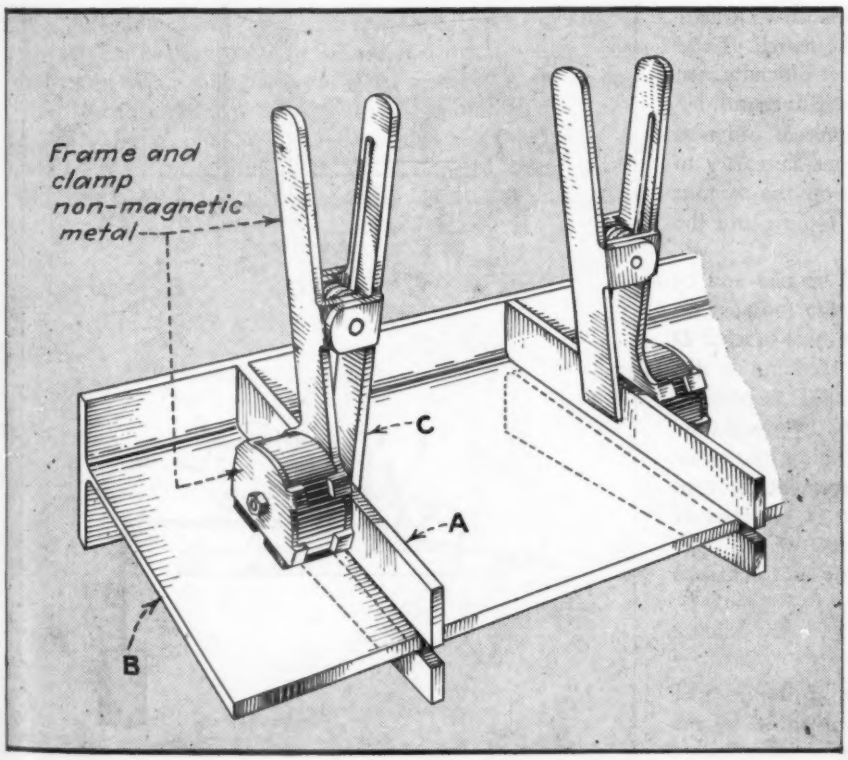
The illustrated use of a 0-¼ in. Jacobs medium-duty chuck *A*, fitted as a punch holder to the press ram, facilitates the fitting of punches for stamping small holes in sheet metal, using light presses. This chuck readily accommodates short lengths of drill rod up to ¼ in. diameter, and particularly the wire gage sizes. This makes punch replacement easy and machine work on punches is reduced to a minimum, especially when soft punches are used. The use of the latter increases the life of dies.

To facilitate faster set-up in regard to center-punch layouts and to increase accuracy, the punch may be exchanged for one with a sharp point for use as a locator. After stops have been set on the punch press for a particular production run, the pointed locator may be exchanged for the punch to be used. Since the chuck is self-centering, no loss of accuracy is incurred.

The described practice saves tool steel, and since drill rod is used, machining is eliminated, other than cutting and grinding. The practice saves lost time in replacing machined punches, and renewal can be accomplished by relatively inexperienced help. Quality of work is improved because of the ease in keeping tools in shape. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*


To fit press ram
Flats to facilitate removal of chuck
Thrust of punch taken up here. No center hole if piece is turned on centers
Drill chuck
Punch

A drill chuck can be used on the ram of a light press for punching holes up to ¼ in. diameter in sheet metal. Punches made from drill rod increase the life of dies

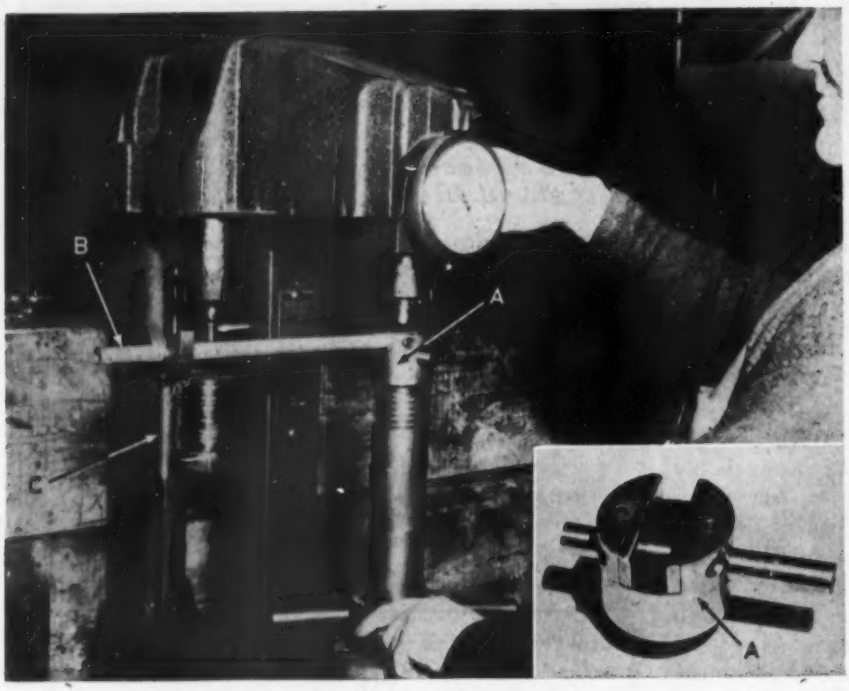


Magnetic Clamp Holds Subassemblies for Welding

BY WENDELL W. JENNINGS
Bethlehem Steel Company

When welding gussets and brackets *A* to structural members *B*, it is common practice to make several tack welds while the bracket is held by the welder or fitter. Elimination of danger from the flash, readjustment of material if a false pass is made by the welder, and danger of burning are eliminated by holding the bracket in position with clamp *C* fitted with a permanent magnet. The magnet will hold the bracket accurately to the layout line while it is tacked, and since this can be done quickly, there is an increase in production. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

A clamp fitted with a permanent magnet facilitates the fitting of brackets for welding



This anvil for a Rockwell hardness tester holds tubing central, produces consistent and accurate results, and reduces operator fatigue

Anvil Speeds Hardness Testing of Tubes

BY PAUL E. GRUBE
Summerill Tubing Company

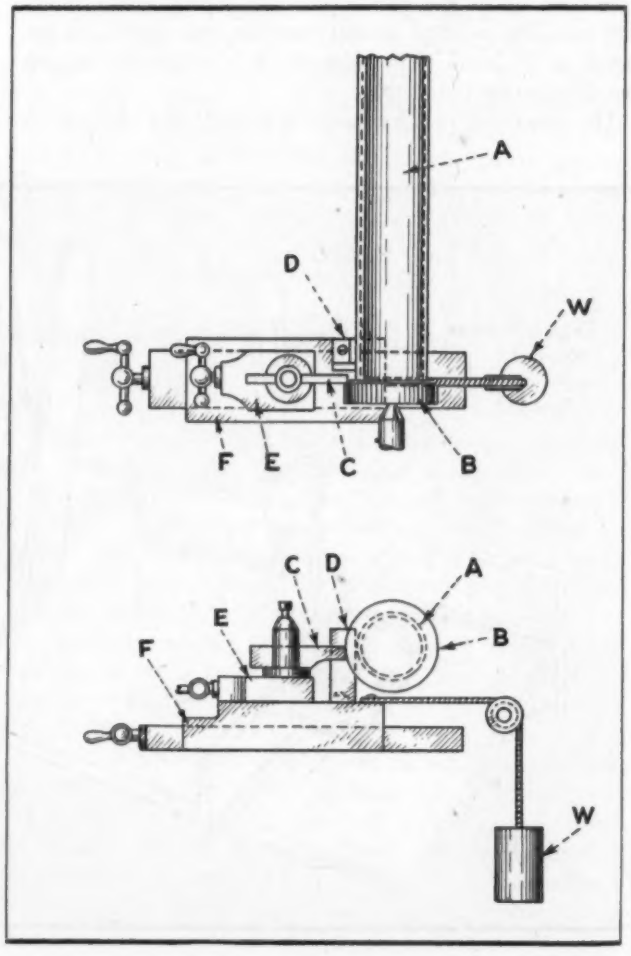
Anvil *A* shown in the drawing is used to expedite the hardness testing of tubes by eliminating the necessity for holding the tube while making the test, which is the method employed when using the standard anvil. Pipe *B*, supported outboard by stand *C*, can now be set under the diamond for making an accurate reading. Previously, the operator had to hold the tube accurately in position under the diamond while setting and tripping the machine, which was not always productive of accurate results. The adoption of this new anvil has reduced operator fatigue, produced consistent results, and has increased production about 75 percent compared to the old method. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Fillet Turned Without Undercutting Warped Pipe

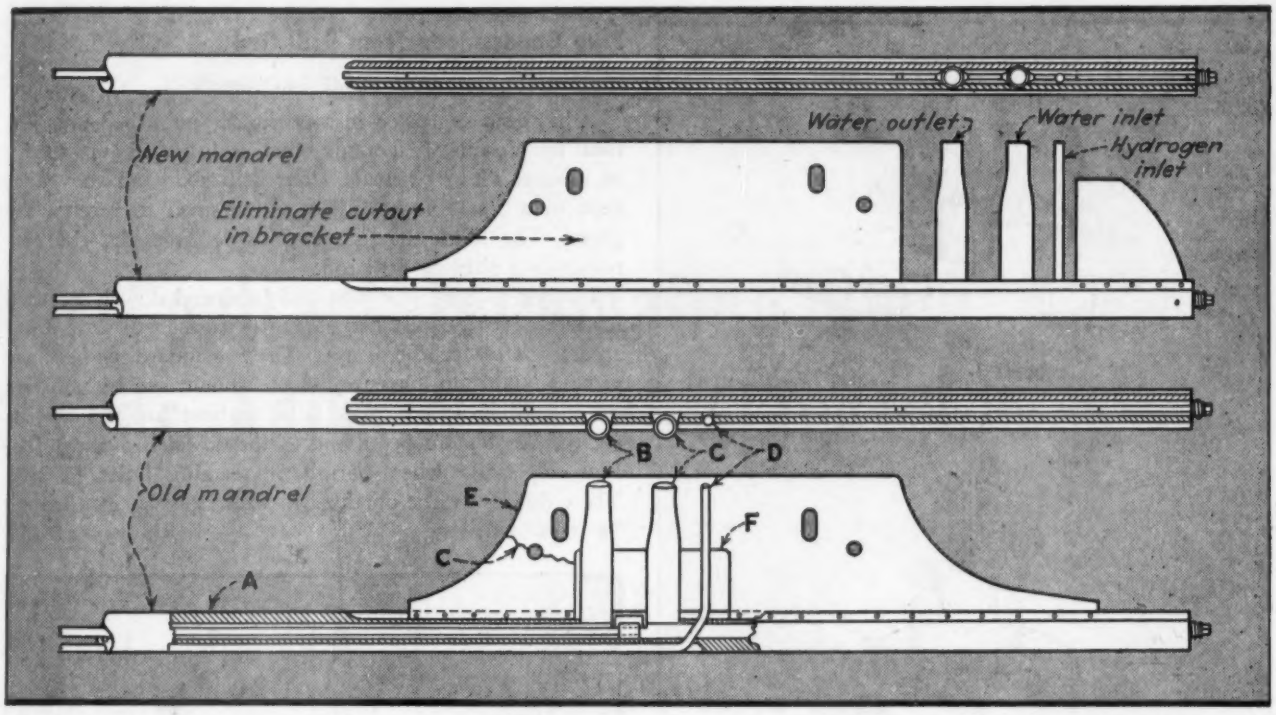
BY L. KASPER

A large number of pieces consisting of a solid flange brazed on the end of a tube were to be faced on both sides of the flange. The main requirements were parallelism between the two sides of the flange, and a sharp corner without undercutting on the tube side of the flange. These requirements could ordinarily be met without difficulty, but it was discovered that the tubing was out-of-round because of distortion from brazing. Therefore, in order to produce the required sharp corner, it became necessary to provide means whereby the tool would follow the contour of the tubing. The drawing illustrates the tooling and the method devised.

Tube *A*, carrying flange *B*, is supported on one end by the tailstock center. Tool *C* is carried in the toolpost on the compound slide in the usual manner. Guide bracket *D* is attached to cross-slide *F* on which the feed nut is disengaged. Bracket *D*, which is located as close as possible to tool *C*, is held in contact with the tube by weight *W* suspended at the rear of the lathe. In operation, the cross-slide is given an irregular in-and-out movement, as controlled by the contact of guide *D* on tube *A*. In-feed of tool *C* is provided by turning the feedscrew of the compound slide *E* until the cutting edge of the tool contracts tube *A*, which is then cut as required.



When turning a sharp corner between a flange and warped pipe, undercutting the pipe is prevented by the tooling set-up shown here



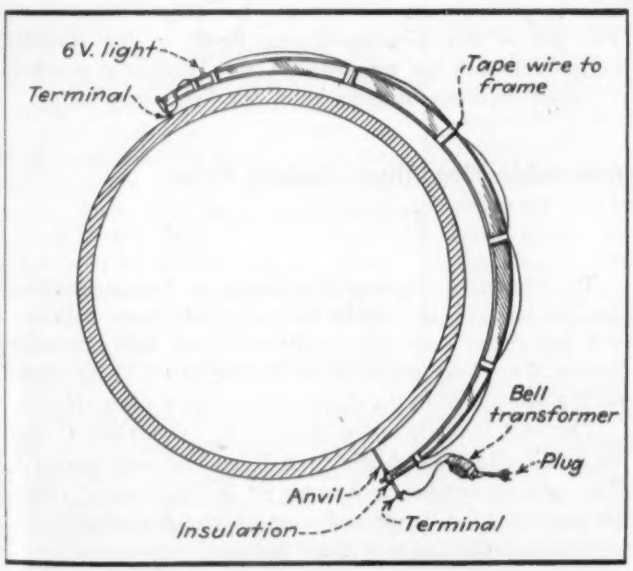
Changing the locations of water and hydrogen tubes on this mandrel for seam-welder roller plugs reduces production and maintenance costs

Improves Design of Seam-Welder Mandrel

BY LOUIS J. SHEARER
The Metal Forming Corporation

Mandrel *A* is the type commonly used for seam roller plugs on welding machines. Water outlet *B*, water inlet *C*, and hydrogen inlet *D* are offset from the center line of the mandrel; therefore, changing these tubes from one side to the other for right- and left-hand machines involves considerable work. The tubes are silver soldered to the orifices and repeated changes weaken them considerably.

The new mandrel has been designed with the tubes on the center line and so positioned to make it interchangeable for right- and left-hand machines. Bracket *E* on the old mandrel has a cutaway section *F* for the tubes, and this weakened the bracket with the result that it frequently broke along line *G*. There is no cutaway section in the bracket on the new mandrel. The added strength of this bracket has eliminated breakage and maintenance costs resulting therefrom. Welding machines equipped with the new mandrel can be kept in constant production. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

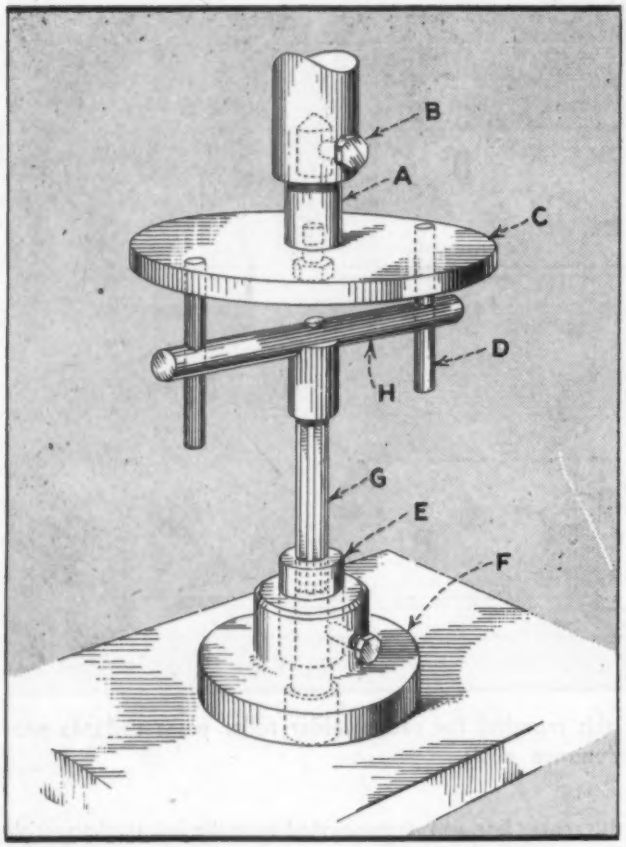


Large Micrometer Equipped With Signal Light

BY M. E. BURCH
Marinship Corporation

An electric signal light connected to a large micrometer will provide a more accurate measurement than when determining the calibration by sense of touch. It is difficult to hold a large micrometer steady and at the same time feel the exact degree of contact necessary. With the illustrated device, the signal light flashes on as soon as contact is made, assuring the operator of an accurate reading. The terminals are soldered to the anvil and the micrometer spindle. Current is supplied by plugging into a 110 volt line, the voltage being cut to 6 volts by a bell transformer. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Accurate readings can be made with large heavy micrometers in minimum time by equipping it with this electric signal light



This reamer is fitted to a round bar drilled to receive two guide pins fastened to a plate on the drill press spindle. The weight of the bar feeds the reamer

Machine Reamer Fed By Gravity

BY ROBERT MAWSON

Before the war, a small New England company made textile equipment on which the machining limits were generous. The wartime job this company obtained involved the reaming of a hard steel ordnance part, which when done by conventional methods resulted in scored holes. Reaming with the tool fed by the drill press, hand feeding by the operator, changing the cutting angles on the reamers, and experimenting with various types of cutting fluids, all proved futile. The problem was finally solved by using the device shown in the drawing.

Shouldered stud *A* was made to fit the spindle of the drill press and held in position with setscrew *B*. To this stud was fastened round plate *C* 12 in. diameter and ½ in. thick. Two ½ in. diameter steel pins *D*, approximately 8 in. long, were fastened in the plate. Part *E* to be reamed was set in the fixture *F*. The square end of reamer *G* was fitted into round bar *H*, which was also drilled to receive steel pins *D*.

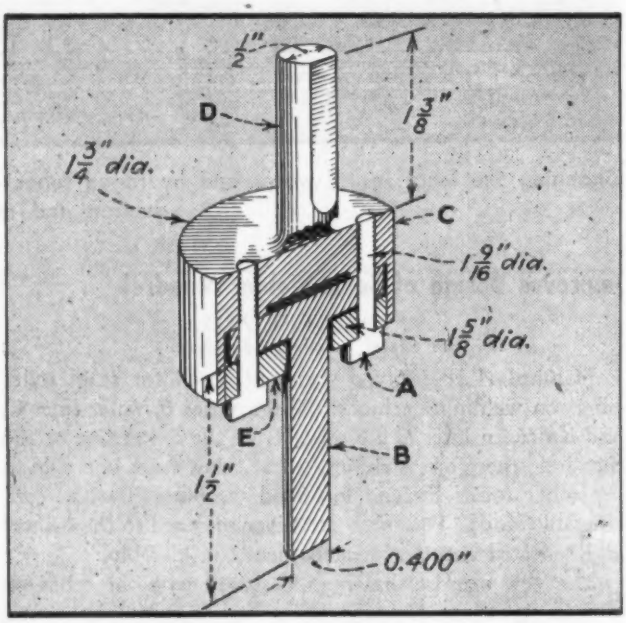
When reaming the part, the weight of bar *H* feeds the reamer through the piece automatically. Experiments were made to ascertain the best weight of bar to use. For the job in question, which was the reaming of a ½ in. hole, a bar 8 in. long and 1 in. diameter proved satisfactory.

Plug Gages Made From Drill Rod

BY JEROME GROSSMAN

It has been suggested in a previously published practical idea by Verne M. Loomis, that plug gages up to ¾ in. diameter can be made from drill rod, and the gages kept in a steel block drilled and reamed to receive the gages. The block then serves as hole gages for the corresponding sizes of drill rod.

I would suggest that standard hardened dowels be used instead of drill rod, because soft gages will lose their accuracy after repeated use. These standard dowels are ground 0.0002 in. oversize, which amount can be polished off in a high speed collet lathe without loss of concentricity. The short tapered end of the dowel is a convenient lead, especially when boring or reaming holes to size. These dowels can be obtained in sizes from ⅛ in. through ⅞ in. diameter.



The pin of this aligning device floats in the retainer body, and can be adjusted to zero indicator reading when locating bushing holes for finish machining

Adjustable Plug Aligns Bushing Holes

BY C. O. HOLMQUIST

The illustrated aligning plug device for locating bushing and pin holes in jigs, can be held in a drill chuck or Woodruff key cutter stem. It is adjusted to an indicator while screws *A* are loosened to allow floating pin *B* to be tapped with a soft mallet to the desired zero mark on the indicator.

The tool is made up of three parts: Container *C* with its holding stem *D*, floating pin *B*, and retainer washer *E*. The retainer washer is a snug fit in container *C*, while clearance on the flange and stem of pin *B* permits radial adjustment when screws *A* are loosened.

War Contract Termination Plan Speeds Adjustment of Claims

The most critical period of the war is upon us. Victory is our first duty. But as Mr. Baruch points out, we should prepare for peace in time of war, just as we prepare for war in time of peace.

We agree with the Truman Committee that for the good of the nation forward planning must be done now. Such planning is designed to remove obstacles which would otherwise render reconversion difficult or impossible.

In keeping with this policy, we are presenting the first of a series of Reconversion Sections dealing with problems of contract termination and of reconversion itself.

These sections will be published from time to time. They will supplement our regular editorial service to our readers whereby in each issue the new metal-working practices are described that will help to turn out more and better war goods with which to overwhelm our enemies.

WAR CONTRACT TERMINATION is not as simple as it sounds. It is fraught with pitfalls for companies which refuse to recognize its full significance. The pitfalls are removed, however, for industrial firms that face contract termination realistically and establish sound organization practice to insure prompt presentation of claims for payment. Such practice has been initiated by Lyon Metal Products, Inc., and it is working efficiently.

The Lyon program did not emerge overnight. It stems from trial, error, and hard experience. In recent months the company has engaged in the termination of approximately 250 of more than 3,000 prime and subcontracts held with the Army, Navy and Maritime Commission.

To understand thoroughly the complexity of the task confronting Lyon, it can be pointed out that the contracts and subcontracts are supervised by Army Ordnance, the Signal Corps, the Quartermasters' Corps, the Army Engineers, Army Air Forces, Navy's Bureau of Ships, Bureau of Ordnance and Bureau of Aeronautics, the Maritime Commission, in addition to subcontracts from a large group of prime contractors who have to certify termination claims to these same military services.

Obviously every effort had to be exerted to eliminate confusion, duplication and errors. Forms had to be prepared to meet adequately all phases of termination and cut-backs. A total of 14 forms was decided upon to provide adequate inventory records, cost records and other essential data to insure submission of claims within a reasonable time. The importance of adequate inventory and cost records cannot be over-emphasized.

A top company executive, the treasurer, was placed in charge of the program of organizing procedure and personnel so that each termination could be handled according to plan with a time limit on each departmental operation.

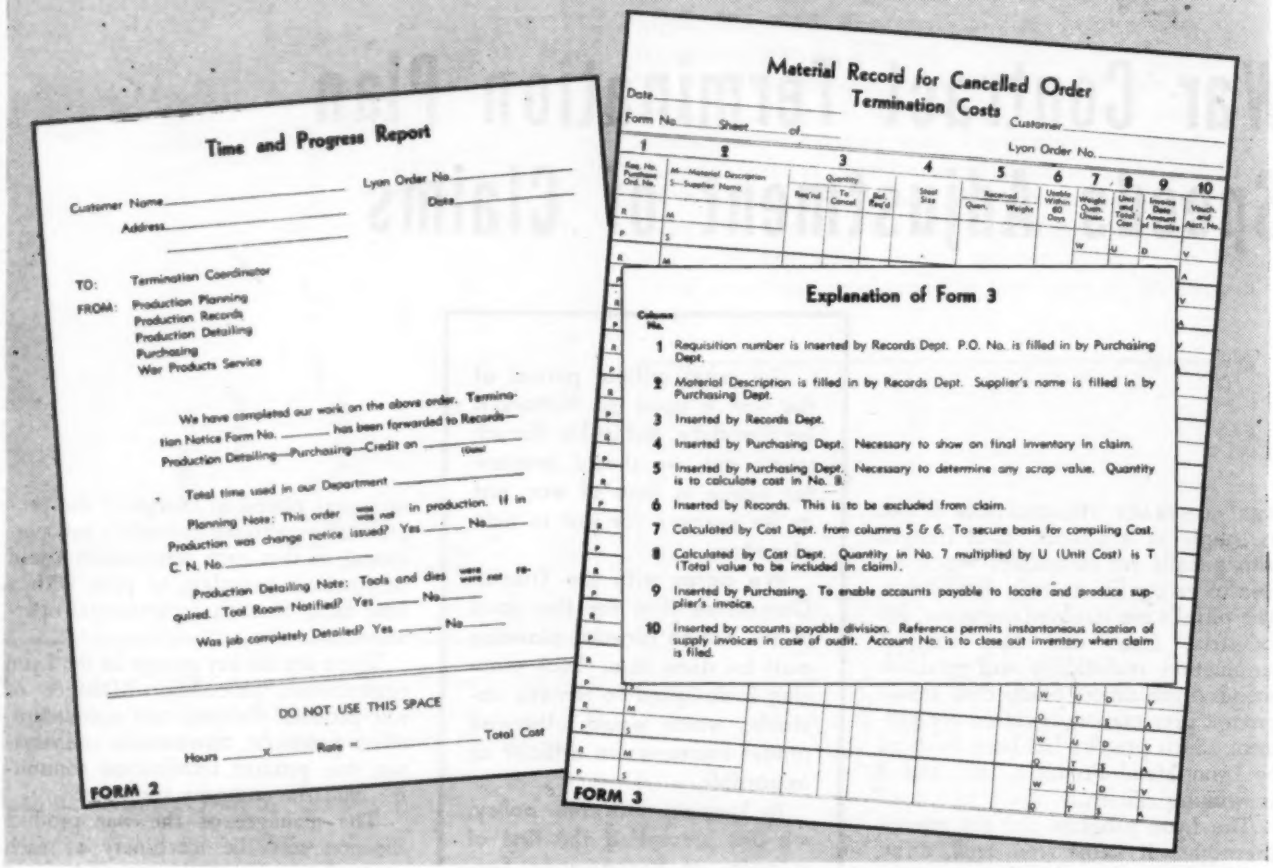
There are six key groups in the Lyon organization procedure: Manager of war product division, cost accountant, claim processor, termination coordinator, war product termination committee, and the company treasurer.

The manager of the war product division sets the machinery of each contract termination in motion because his department has the only direct contact with the customer—the government. The cost accountant serves as a financial supervisor, making certain that all claims are proper and can be substantiated, and checking the completeness of every claim. The claim processor superintends the inventory, ear-marking of materials in process, and checks all stoppages of production and tool cancellations.

The termination coordinator is responsible for obtaining all facts rapidly. He follows through to see that all company procedures are expedited and checks the completeness of each departmental function. A final complete check is made by the war product termination committee which consists of the termination coordinator, assistant treasurer, process engineer and manager of the war product division.

The company treasurer makes the final approval of the claim. If the claim exceeds $10,000, the treasurer

Departmental procedure and forms established by Lyon Metal Products, Inc., permit complete inventory of materials and parts so that claims can be interpreted easily by auditors. Program made available to manufacturers confronted with termination proceedings



Time and Progress Report

Customer Name _____ Lyon Order No. _____

Address _____ Date _____

TO: Termination Coordinator

FROM: Production Planning
Production Records
Production Detailing
Purchasing
War Products Service

We have completed our work on the above order. Termination Notice Form No. _____ has been forwarded to Records—Production Detailing—Purchasing—Credit on _____ (Date)

Total time used in our Department _____

Planning Note: This order was / was not in production. If in Production was change notice issued? Yes _____ No _____

C. N. No. _____

Production Detailing Note: Tools and dies were / were not required. Tool Room Notified? Yes _____ No _____

Was job completely Detailed? Yes _____ No _____

DO NOT USE THIS SPACE

Hours _____ X _____ Rate = _____ Total Cost

FORM 2

Material Record for Cancelled Order Termination Costs

Date _____ Customer _____

Form No. _____ Sheet _____ of _____ Lyon Order No. _____

1	2	3			4	5		6	7	8	9	10
Req. No. Purchase Ord. No.	M—Material Description S—Supplier Name	Quantity Req'nd	To Cancel	Bal. Req'd	Steel Size	Received Quan.	Weight	Unable Within 60 Days	Weight Quan. Unable	Unit and Total Cost	Invoice Date Amount of Invoice	Voucher and Acct. No.
R	M											
P	S									W	U	D V
R	M											A
P	S									W	U	D V
R	M											A
P	S									W	U	D V
R	M											A
P	S									W	U	D V
R	M											A
P	S									W	U	D V
R	M											A
P	S									W	U	D V
R	M											A
P	S									W	U	D V
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P	S									W	U	D V
R	M											A
P	S									W	U	D V
R	M											A
P	S									W	U	D V
R	M											A
P	S									W	U	D V
R	M											A
P	S									W	U	D V

Explanation of Form 3

Columns No.

1 Requisition number is inserted by Records Dept. P.O. No. is filled in by Purchasing Dept.

2 Material Description is filled in by Records Dept. Supplier's name is filled in by Purchasing Dept.

3 Inserted by Records Dept.

4 Inserted by Purchasing Dept. Necessary to show on final inventory in claim.

5 Inserted by Purchasing Dept. Necessary to determine any scrap value. Quantity is to calculate cost in No. 8.

6 Inserted by Records. This is to be excluded from claim.

7 Calculated by Cost Dept. from columns 5 & 6. To secure basis for compiling Cost.

8 Calculated by Cost Dept. Quantity in No. 7 multiplied by U (Unit Cost) is T (Total value to be included in claim).

9 Inserted by Purchasing. To enable accounts payable to locate and produce supplier's invoice.

10 Inserted by accounts payable division. Reference permits instantaneous location of supply invoices in case of audit. Account No. is to close out inventory when claim is filed.

FORM 3

discusses it with the president and vice president of sales before submitting it to the government agency.

Under the detailed plan, a time limit is placed on each departmental operation. Each department is required to record the time spent in preparing its phase of the information required for contract termination. The system is set up so that several departments can work concurrently on a specific termination claim without overlapping or interfering with each other. This expedites preparation of the claim.

Upon receiving notice of contract termination, the war product division manager issues termination notices on Form I to the following departments: Sales order interpreters, production planning, production records, production detailing, purchasing, production, termination coordinator and cost.

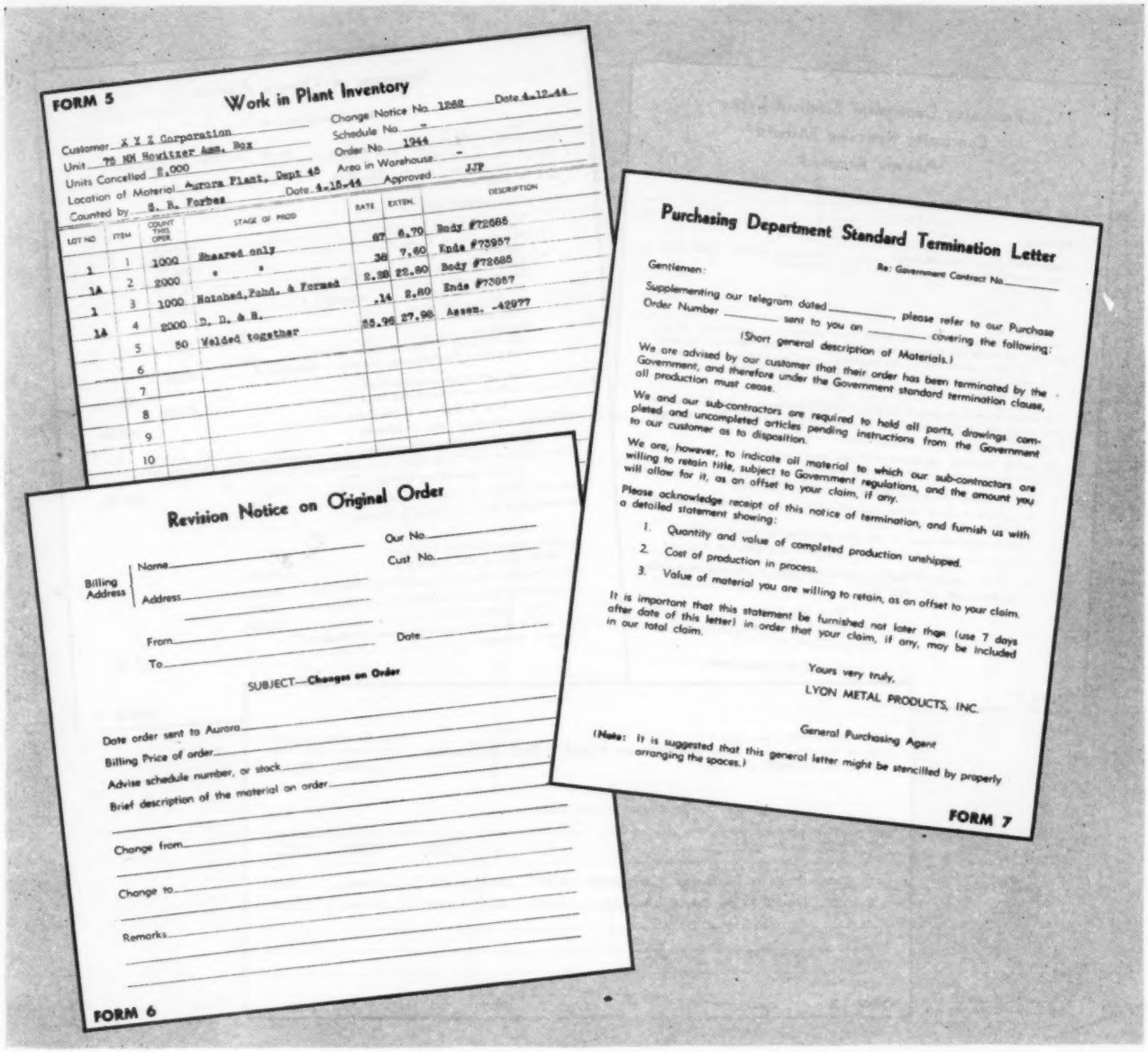
Salient departmental functions follow:

Sales Order Interpreters—Check details of termination billing order; revise or cancel original order; send termination billing order and a revision notice on original order (Form 6) to Production Planning within 24 hours.

Production Planning—If the order is in production, issue a change notice to Production and attach: Production copy of termination notice, inventory instruction sheet (Form 4), and inventory sheet (Form 5). Prepare material record (Form 3) for special purchased parts in quadruplicate listing requisition number, quantity requisitioned, quantity to cancel, quantity to receive, and amount usable within 60 days.

Production Records—Check and complete Form 3 received from Production Planning and list unusable raw materials, sending list to Purchasing immediately. Cancel or reduce any outstanding requisitions not yet sent to Purchasing. Upon receipt of two copies of Form 3 returned by Purchasing, send one copy to Production instructing that all parts, supplies, and other unusable raw materials purchased for the contract must be segregated and ear-marked. Notify Production to issue "Material Return Memorandum" to cover any returns to stock of material usable within 60 days and revise stock records accordingly. Remove material which is to be included in the claim from stock records and enter same on special segregated record of cancelled materials.

Production Detailing—Check order



FORM 5

Work in Plant Inventory

Customer X Y Z Corporation
Unit 75 MM Howitzer Asm. Box
Units Cancelled 2,000
Location of Material Aurora Plant, Dept 46
Counted by S. R. Forbes
Change Notice No. 1268 Date 4-12-44
Schedule No. –
Order No. 1344
Area in Warehouse –
Date 4-15-44 Approved JJP

LOT NO	ITEM	COUNT THIS OPER	STAGE OF PROD	RATE	EXTEN.	DESCRIPTION
1	1	1000	Sheared only	.07	6.70	Body #72685
1A	2	2000	" "	.36	7.60	Ends #73957
1	3	1000	Notched, Pshd. & Formed	2.36	22.80	Body #72685
1A	4	2000	D. D. & B.	.14	2.80	Ends #73957
	5	50	Welded together	55.96	27.98	Assem. -42977
	6					
	7					
	8					
	9					
	10					

Purchasing Department Standard Termination Letter

Gentlemen: Re: Government Contract No.

Supplementing our telegram dated _____, please refer to our Purchase Order Number _____ sent to you on _____ covering the following:

(Short general description of Materials.)

We are advised by our customer that their order has been terminated by the Government, and therefore under the Government standard termination clause, all production must cease.

We and our sub-contractors are required to hold all parts, drawings completed and uncompleted articles pending instructions from the Government as to disposition.

We are, however, to indicate all material to which our sub-contractors are willing to retain title, subject to Government regulations, and the amount you will allow for it, as an offset to your claim, if any.

Please acknowledge receipt of this notice of termination, and furnish us with a detailed statement showing:

1. Quantity and value of completed production unshipped.
2. Cost of production in process.
3. Value of material you are willing to retain, as an offset to your claim.

It is important that this statement be furnished not later than (use 7 days after date of this letter) in order that your claim, if any, may be included in our total claim.

Yours very truly,
LYON METAL PRODUCTS, INC.

General Purchasing Agent

(Note: It is suggested that this general letter might be stencilled by properly arranging the spaces.)

FORM 7

Revision Notice on Original Order

Our No.
Cust No.
Billing Address: Name, Address
From
To
Date

SUBJECT—Changes on Order

Date order sent to Aurora
Billing Price of order
Advise schedule number, or stock
Brief description of the material on order
Change from
Change to
Remarks

FORM 6

for tools and dies, and issue stop notice for any tool or die in process for this order.

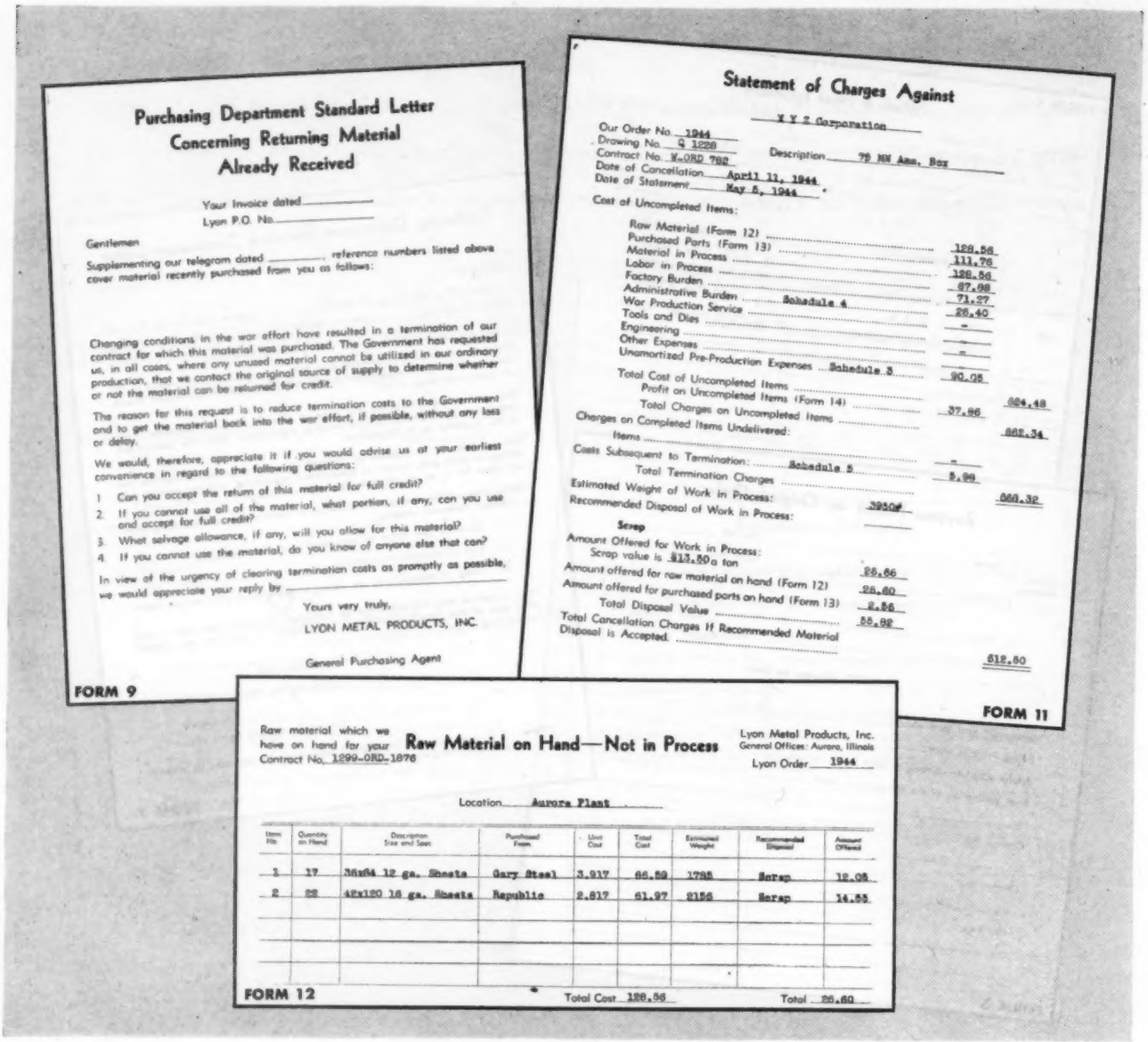
Purchasing—Upon receipt of Form 3 from Production Records, enter: Purchase order number, supplier's name, steel sheet sizes, quantity received, weight received, invoice date, amount of invoice. If materials have not been received, telegram and letter (Form 7) shall be sent to suppliers and subcontractors, in cases of total termination. Use Form 8 for partial termination orders showing government contract number. If Lyon cannot use materials received, obtain authority from supplier to return for credit (Form 9). Return of two copies of Form 3 to Production Records serves to advise that disposition of material has been completed and material is no longer available for any order received after form was issued.

Production—Upon receipt of termination notice from Production Planning, stop immediately all production on cancelled portions of the contract. Stop all work on tools and dies. Instruct Purchasing to cancel outstanding purchase orders for special equipment. Upon receipt of Form 3 from Production Records, segregate and ear-mark all material listed for cancellation. Count, tag and isolate cancelled portion of material in process, and record stage of production of each part on Form 5, which is then sent to termination coordinator.

After checking to see that all data is complete, the termination coordinator forwards it to Cost Department where total charges are compiled for each terminated contract, and a statement of charges is forwarded to the termination committee. The latter reviews all claims, marks its approval and forwards them to the treasurer. The claim is billed and mailed after receiving the treasurer's approval.

The final claim is set up in "accounts receivable" and the various inventory, work in process or other asset accounts credited. The difference between the total claim and the credits to the various asset accounts, is credited to a suspense account until the claim is paid. When paid, this suspense account is credited to a "profit or loss on terminated contracts" account. All work in connection with presenting and negotiating the claim is supervised by the treasurer.

It is interesting to note how Lyon arrives at the "unamortized pre-production expense" chargeable to the customer as part of the termination claim. The following shows how



Purchasing Department Standard Letter Concerning Returning Material Already Received

Your Invoice dated _____
Lyon P.O. No. _____

Gentlemen

Supplementing our telegram dated _____, reference numbers listed above cover material recently purchased from you as follows:

Changing conditions in the war effort have resulted in a termination of our contract for which this material was purchased. The Government has requested us, in all cases, where any unused material cannot be utilized in our ordinary production, that we contact the original source of supply to determine whether or not the material can be returned for credit.

The reason for this request is to reduce termination costs to the Government and to get the material back into the war effort, if possible, without any loss or delay.

We would, therefore, appreciate it if you would advise us at your earliest convenience in regard to the following questions:

1. Can you accept the return of this material for full credit?
2. If you cannot use all of the material, what portion, if any, can you use and accept for full credit?
3. What salvage allowance, if any, will you allow for this material?
4. If you cannot use the material, do you know of anyone else that can?

In view of the urgency of clearing termination costs as promptly as possible, we would appreciate your reply by _____

Yours very truly,
LYON METAL PRODUCTS, INC.

General Purchasing Agent

FORM 9

Statement of Charges Against

X Y Z Corporation

Our Order No. 1944
Drawing No. Q 1226
Contract No. W-ORD 792
Description 75 MM Ammo. Box
Date of Cancellation April 11, 1944
Date of Statement May 5, 1944

Cost of Uncompleted Items:

Raw Material (Form 12)	128.56	
Purchased Parts (Form 13)	111.76	
Material in Process	128.56	
Labor in Process	67.68	
Factory Burden	71.27	
Administrative Burden Schedule 4	26.40	
War Production Service	-	
Tools and Dies	-	
Engineering	-	
Other Expenses	-	
Unamortized Pre-Production Expenses Schedule 3	90.05	
Total Cost of Uncompleted Items	37.86	604.48
Profit on Uncompleted Items (Form 14)		
Total Charges on Uncompleted Items		862.34
Charges on Completed Items Undelivered:		
Items	-	
Costs Subsequent to Termination: Schedule 5	5.98	
Total Termination Charges		868.32
Estimated Weight of Work in Process: 3950#		
Recommended Disposal of Work in Process:		
Scrap		
Amount Offered for Work in Process:		
Scrap value is $13.50 a ton		
Amount offered for raw material on hand (Form 12)	28.66	
Amount offered for purchased parts on hand (Form 13)	28.60	
Total Disposal Value	2.56	
Total Cancellation Charges If Recommended Material Disposal is Accepted	55.82	
		812.50

FORM 11

Raw material which we have on hand for your Contract No. 1299-ORD-1878

Raw Material on Hand—Not in Process

Lyon Metal Products, Inc.
General Offices: Aurora, Illinois
Lyon Order 1944

Location Aurora Plant

Item No.	Quantity on Hand	Description Size and Spec	Purchased From	Unit Cost	Total Cost	Estimated Weight	Recommended Disposal	Amount Offered
1	17	36x84 12 ga. Sheets	Gary Steel	3.917	66.59	1785	Scrap	12.05
2	22	42x120 16 ga. Sheets	Republic	2.817	61.97	2156	Scrap	14.55

FORM 12

Total Cost 128.56 Total 26.60

Schedule 3 is arrived at for hypothetical charges in Form 11.

"Unamortized pre-production expense represents that portion of the cost incurred to purchase, receive, record, and store materials, and engineer and detail the job, which has not been prorated to the contract. This pre-production expense is only applied to total cost as labor is expended," the company explains. "Since no labor has been expended on that portion of the contract which has not been put into production and only part of labor on the uncompleted portion that is in production, we are entitled to claim the unamortized cost actually incurred.

"Pre-production expense consists of shop clerical departments plus steel stores and parts stores costs. Related to total factory burden, this equals 17.7 percent. Unit factory burden which would have been applied to the 2,000 units is found by applying the standard burden rate of — percent to the unit labor cost. Labor cost per estimate is 28 cents. Burden cost is therefore — percent of 28 cents, or 29 cents per unit.

"Total factory burden on the 2,000 uncompleted units should therefore be $580 if we had been permitted to complete them. From this we must deduct the burden already charged to work in process, on the claim $71.27. This leaves the unapplied factory burden on the 2,000 units of $508.73. Pre-production expense unamortized is therefore 17.7 percent of $508.73 or $90.05 which we now include in our claim."

In further explaining the statement of charges listed in Form 11, the company shows how it determines the "administrative burden" chargeable to the uncompleted portion of the contract. This is listed as Schedule 4.

"To determine percentage of completion for application of burden charges, factory door cost of uncompleted items is $598.08. Unit factory door cost of uncompleted items: 1,000 items, material purchased but no work done; 1,000 items in process; total of 2,000 items uncompleted.

"Thus we get

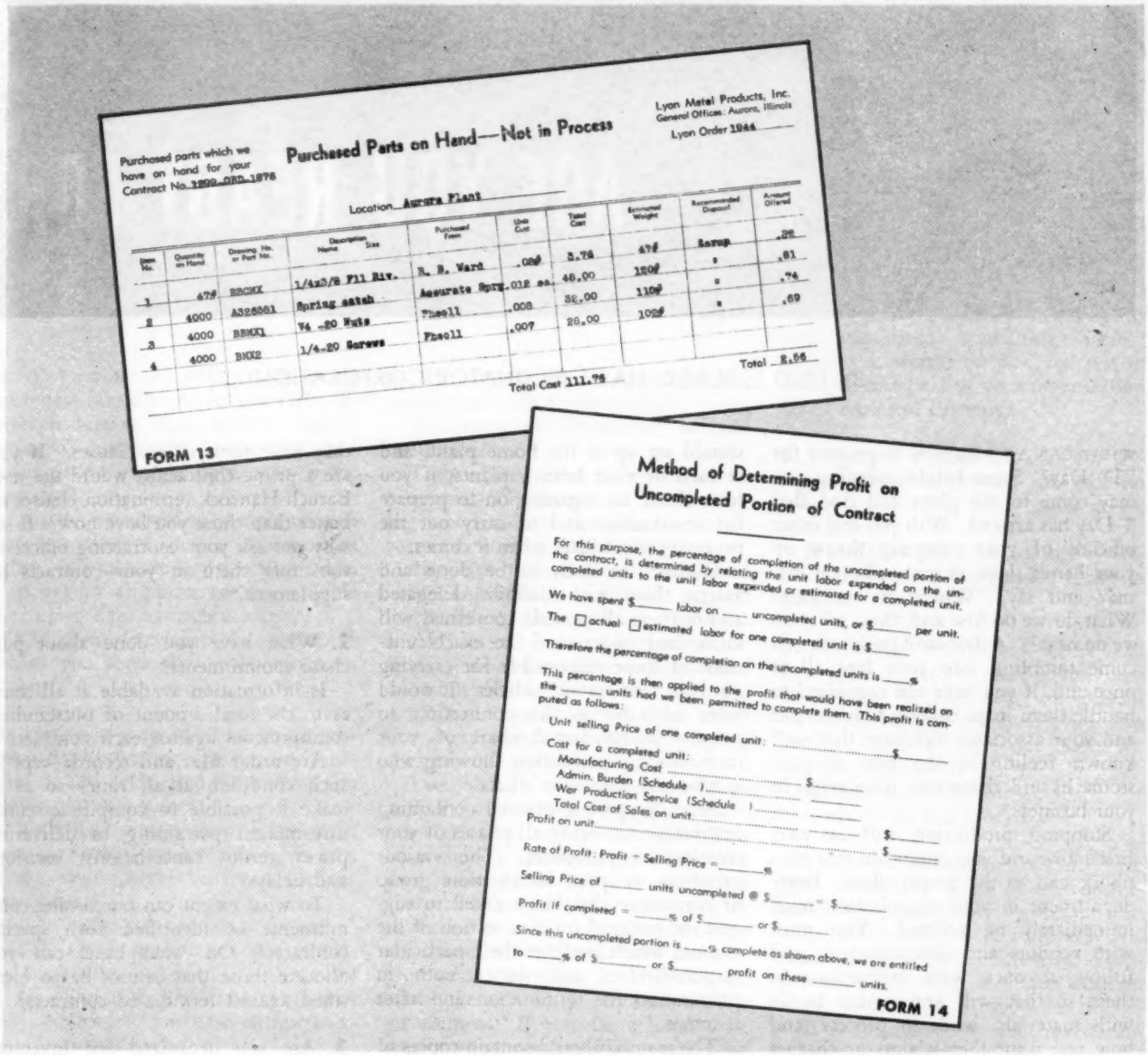
$$\frac{598.08}{2000} = .299$$ unit factory door cost of uncompleted items

"Factory door cost of one completed item

Material	.18
Labor	.28
Burden (labor)	.29
	.75 Factory

door cost on one complete item.

"Percentage of completion for ap-



Purchased parts which we have on hand for your Contract No. 1899-OSD-1876

Purchased Parts on Hand—Not in Process

Lyon Metal Products, Inc.
General Offices: Aurora, Illinois
Lyon Order 1944

Location Aurora Plant

Item No.	Quantity on Hand	Drawing No. or Part No.	Description Name	Size	Purchased From	Unit Cost	Total Cost	Estimated Weight	Recommended Disposal	Amount Offered
1	47#	BBCHX	1/4x3/8 Fil Hiv.		R. B. Ward	.08#	3.76	47#	Scrap	.28
2	4000	A326881	Spring catch		Accurate Spg.	.012 ea.	48.00	120#	"	.81
3	4000	BBHX1	#4 -20 Nuts		Fbsell	.008	32.00	110#	"	.74
4	4000	BHX2	1/4-20 Screws		Fbsell	.007	28.00	102#	"	.69

Total Cost 111.76 — Total 2.56

FORM 13

Method of Determining Profit on Uncompleted Portion of Contract

For this purpose, the percentage of completion of the uncompleted portion of the contract, is determined by relating the unit labor expended on the uncompleted units to the unit labor expended or estimated for a completed unit.

We have spent $_____ labor on _____ uncompleted units, or $_____ per unit.

The ☐ actual ☐ estimated labor for one completed unit is $_____

Therefore the percentage of completion on the uncompleted units is _____%

This percentage is then applied to the profit that would have been realized on the _____ units had we been permitted to complete them. This profit is computed as follows:

Unit selling Price of one completed unit: ..... $_____

Cost for a completed unit:
Manufacturing Cost ..... $_____
Admin. Burden (Schedule) ..... _____
War Production Service (Schedule) ..... _____
Total Cost of Sales on unit ..... _____ $_____

Profit on unit ..... $_____

Rate of Profit: Profit ÷ Selling Price = _____%

Selling Price of _____ units uncompleted @ $_____ = $_____

Profit if completed = _____% of $_____ or $_____

Since this uncompleted portion is _____% complete as shown above, we are entitled to _____% of $_____ or $_____ profit on these _____ units.

FORM 14

plication of administrative burden equals:

$$\frac{\text{Unit factory door cost on uncompleted items } .299}{\text{Unit factory door cost on completed items } .75} = 30 \text{ percent complete}$$

"Selling price of one unit if completed..... $1.10

1.10 × 2,000=2,200.

"Administrative burden if 2,000 items were complete:

4 percent × 2,200=$88.

"Administrative burden chargeable to uncompleted portion:

30 percent × 88=$26.40.

Schedule 5 included in Form 11 represents cost incurred subsequent to cancellation and involves departmental charges as follows:

Planning Department...	2.0 hr.
Records Department...	0.7 hr.
Purchasing Department.	1.0 hr.
Cost Department....	1.5 hr.
	5.2 hr.
Rate per hour....	$1.15
Charge.....	$5.98

Most of the termination forms used by Lyon are reproduced herewith and they are self-explanatory.

The Lyon firm has printed its procedure in a booklet entitled "How One Company Organized to Handle War Contract Terminations." As a contribution to the war effort, the firm is making the booklet available to war contractors. The booklet has been reviewed in detail by the Readjustment Division of the Army Service Forces at Washington, and the Termination Committee of the National Association of Manufacturers.

The N.A.M. Committee has approved the plan and is mailing the booklet to 12,000 of its membership with the notation, "Based on the Contract Termination Manual of the National Association of Manufacturers and printed at the Association's request by Lyon Metal Products, Inc."

The American Management Association, the American Supply and Machinery Manufacturers Association and the Illinois Manufacturers Association are sending copies to their members.

Many companies faced with terminations for the first time will be able to adapt this plan in part or in its entirety and thus save considerable time and effort. The booklet does not attempt to "interpret regulations." Once the procedure and personnel within a company are organized to obtain the facts, any termination regulation changes can be fitted into the established method of handling.

ARE YOU READY FOR

BY FRED L. BLACK, NASH-KELVINATOR CORPORATION

WHAT CAN YOU do now to prepare for "T" Day? Some bright morning you may come to the plant and find that T Day has arrived. Will you and other officials of your company throw up your hands, look at each other in dismay and say, "Where do we start? What do we do first and, then, what do we do next?" A thousand problems will come tumbling into your laps all at once and, if you have not organized to handle them in an orderly fashion, you and your associates will have that well known feeling in the pits of your stomachs and chaos may soon reign in your business.

Stopping production will be your first move and you cannot do that by a phone call to the power plant. Every department in your organization must immediately be notified. You must wire vendors and subcontractors, and follow at once with instructions to them so they will know what to do with materials, work in process, and how you want their claims or charges presented.

Employees must be paid and laid off. The plant must be cleared of all materials, parts in process and machinery no longer needed. Do you have any idea what you will do about that?

When T Day comes your greatest need will be up-to-the-minute information about your contracts, purchase orders, shipments, inventories, allowable costs, government facilities and your financial situation.

If you have faced facts and carefully considered all contingencies and, then, organized a termination manual for *your* company, which clearly states *your* problems and gives concise instructions to department heads about procedures in event of partial or total contract termination, you will be prepared promptly to present your charges to the government procurement agencies or your vendors, as the case may be.

Your first problem is going to be "Who is going to do what?" You should set up at the home plant, and at each of your branch plants, if you have them, an organization to prepare for termination and to carry out the necessary procedures when it comes.

Outline the jobs to be done and assign them with definite delegated authority so all persons concerned will know and understand the exact functions of those responsible for carrying out your termination policies. It would seem advisable in this connection, to prepare a functional chart of your termination organization showing who is who and who does what.

Next, prepare a manual containing instructions covering all phases of your termination procedure. The various members of your termination group or committee should be asked to suggest the material for that section of the manual which outlines their particular responsibilities and duties both in preparation for termination and after it comes.

The manual should contain copies of all necessary special purchasing, inventory and accounting forms and notices, and instructions which you wish followed in your own and subcontractor's organizations.

The preparation of the manual will do more to develop and organize realistic thinking about your present and potential termination problems than anything else you can do. Without it your various department heads will write memorandums, letters and directives from time to time dealing with termination questions and, then, when all this material is needed in a hurry, it will probably be uncoordinated, if found at all.

The following suggestions are presented as a guide that may prove useful to you in the preparation of a basic T Day manual.

1. Do you know what your contracts or purchase orders specify, in case of partial or complete termination? Do they have termination clauses? If you are a prime contractor, would the new Baruch-Hancock termination clauses be better than those you have now? If so, why not ask your contracting officer to substitute them in your contracts by supplement?

2. What have you done about purchase commitments?

Is information available at all times as to the total amount of outstanding commitments against each contract?

Are order files and records kept in such condition at all times so as to make it possible to compile essential information pertaining to deliveries, prices, terms, cancellations, revisions and delays?

To what extent can purchasing commitments be identified with specific contracts? On what basis can you allocate those that cannot be so identified against terminated contracts?

3. Are you organized for inventory taking? Can you value it with reasonable accuracy? Being able to do that will save time in getting the contractor's or contracting officer's approval for disposal.

If you have not studied the War Department Termination Accounting Manual, TM-14320, it could be well to review it, especially with reference to provisions for taking a physical inventory and the matter of disposal credits.

How quickly can you prepare a detailed descriptive list of all physical inventories claimed as part of the charges? Have you recently reviewed all inventories to ascertain whether excessive quantities are on hand such as raw materials, components, perishable tools and supplies?

Do you know what raw materials, fabricated parts and supplies you will want to keep and not enter in your charges? Until you put in a claim, the material you are now using on war contracts is yours.

"T" Day?

4. At termination, will you be ready with cost breakdowns on materials, direct production labor, indirect factory expense, administrative expense, and unamortized charges applicable to the contract?

Are your production records reliable and accurate? This will be important when it comes to constructing costs.

Are your shipping records reliable and up to date on each contract?

Can you determine the extent to which you must audit subcontractor's claims?

5. Have you prepared a list of government buildings, equipment and machinery and designated those items you may want to acquire?

Your lists should show government costs and what you are willing to pay. These items might be listed in four categories:

(*a*) Those you can use and want
(*b*) Those you can use at a considerable discount
(*c*) Those of doubtful use you can afford to purchase at near salvage value
(*d*) Those you do not want at any price

If you have government facilities, what are the options in your contract to purchase them?

6. What special forms do you need in connection with termination?

Telegrams of notification to subcontractors.

Termination notice forms to follow telegrams. These should be sent by registered mail so that you can be assured of receipt and the date.

The termination notice forms should be accompanied or followed, as soon as possible, with instructions on what to do about unshipped finished articles, parts in process, and unprocessed materials that apply to the order. Instructions should also be given about the organization and presentation of charges.

You should supply subcontractors with a form on which to file a statement of their charges to you. This form should be designed to fit into your system for the presentation of charges to the contractor above you, or to the government, whichever the case may be, and should be as brief and simple as you can make it. It should include the certificate required by the government. If you are a fixed price supply prime contractor, you will need forms for certifying claims of both immediate and remote subcontractors whose charges are part of your claim.

7. Have you organized to preserve your records? You should caution all those having anything to do with records to preserve all pertinent and supporting papers until you have government permission to destroy them. Most government contracts require that records be preserved for three years and then, if the contractor wants to dispose of them, the government will either authorize their destruction or take them off the contractor's hands.

Most contractors have signed Secrecy Agreements, either with the government or have accepted purchase terms and conditions containing secrecy clauses. It would be well for you to warn all members of your organization about return of drawings.

8. Have you organized a plan for laying off those employees you will no longer need when your contracts are terminated?

If you have any great number of layoffs, you may want to prepare forms in advance.

9. Have you determined where and how you are going to store government inventories of machinery, equipment, raw materials and goods in process so you can quickly clear your floors for civilian production?

Do you have the storage space? If not, where can you procure it?

10. Can you establish in advance with your contracting officer or the contractor above you a policy for completion of products which have reached a particular stage of completion when termination comes, rather than stop work all along the line at a moment's notice?

If you can compile a manual to answer these questions as they pertain to your plant, you will be simplifying matters not only for yourself, but for the government which faces a tremendous task when "T" Day becomes Today.

Thousands of war contracts have already been terminated; prospects are that an increasing number of plants may not get replacement government business. If that happens to you, will your organization know what to do for an orderly transition to commercial production?

Small Staff Coordinates Termination Procedure for Multi-Plant Company

BY C. R. FAY, WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY

AN ORGANIZATION to deal with contract termination is one matter that the majority of industrial firms must face in the not too distant future. There are many ways in which a contract-termination staff can be set up. The plan adopted by Westinghouse is devised for a company organized so that each of its manufacturing divisions operates as a unit with only general supervision from top management. Exceptions are the accounting and purchasing departments, which report to headquarters so that standardized procedures for these activities are maintained.

Our primary objective was to use the existing organization to the fullest extent, consistent with prompt and satisfactory settlement of claims. The small headquarters terminations staff is under direction of a vice-president. He is also chairman of a policy committee on termination of war contracts. This committee, in addition to the chairman, consists of the comptroller, the vice-president in charge of purchasing, the manager of the headquarters sales department, and the chairman's assistant, who acts as secretary.

The headquarters termination staff coordinates and supervises general contract-termination problems that do not lend themselves to settlement by existing company departments. In addition to issuing general instructions on the preparation, submission and negotiation of claims, the headquarters staff has authority to negotiate and settle any claim. This authority is not exercised unless the regular operating organization can not settle the matter with reasonable dispatch.

Other instructions necessary to handle terminated contracts properly are issued locally by the manufacturing unit. These cover order-handling, storing and segregating inventories applicable to terminated contracts, and regulations required to coordinate actions of various individuals in the plant.

To keep in direct contact with each of the manufacturing units, the headquarters termination staff has appointed representatives in each of these locations. The termination representative is considered to be the representative of the manager of the operating unit for purposes of coordination and supervision within the unit, but is also considered to be a representative of the headquarters termination staff with regard to policy and general procedures as issued.

The company's general plan of operation requires that some parts of a customer's order be produced in several manufacturing units. Hence it is necessary to have a headquarters group charged with summarizing claims from the several operating units before charges are submitted to customers or the Government. This central group keeps records, issues monthly reports.

The organization will function approximately as follows:

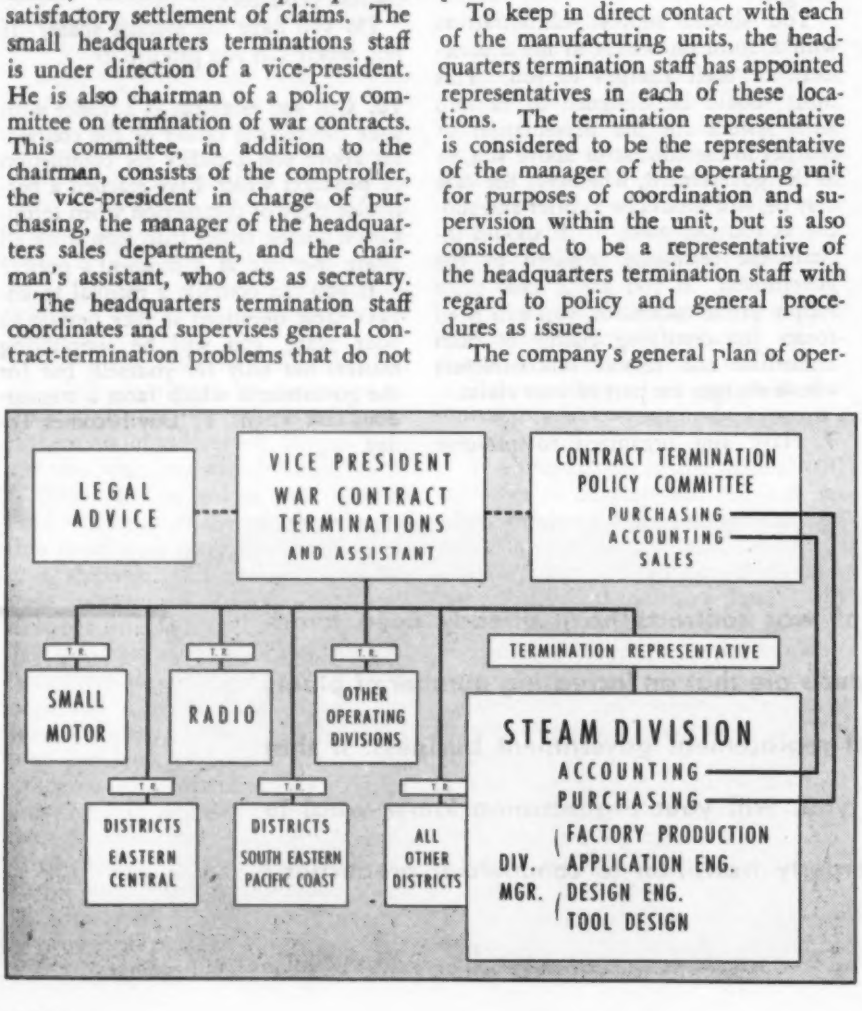
1. A termination notice from a Government agency is received by the district office application engineer, who originally handled entry of the order.

2. A telegram is sent from the order-entering point to the termination representative in the manufacturing unit or units involved in manufacturing for the contract. The termination representative starts wheels turning in the manufacturing division so that work is stopped promptly and suppliers are quickly notified that a termination has been received. He follows development of the claim until the production department has listed and segregated the inventory, the claims of all subcontractors and suppliers have been obtained by the purchasing department, and the accounting department has costed the inventory and developed the total of the claim.

3. The claim is then forwarded by the termination representative to the central record office where it is combined with the claims of other manufacturing divisions if necessary, and where proper record is made of the amount of the claim.

4. The claim is then forwarded to the termination representative in the district office who transmits the claim to the customer through the application engineer who originally handled the order. The district termination representative is responsible for following the claim until a customer has given authority for the company to bill and until the cash has been collected.

The headquarters staff will be asked to assist in settling the claim if serious questions arise in regard to the amount of the claim or the disposition of the inventory developed during the course of the settlement.



Safe Operation of Mounted Wheels and Points—I

SEVERAL NEW TYPES of grinding wheels have come into extensive use since publication of the 1935 revision of the American Standard Safety Code for Use, Care and Protection of Abrasive Wheels. One of the joint sponsors of the Code, the Grinding Wheel Manufacturers Association, undertook extensive research into development of standard rules for safe operation of mounted wheels and points. The results of this study are embodied in the 1943 revision of the Safety Code issued by the American Standards Association.

•

Mounted wheels (sometimes called "mounted points") are small wheels, usually 2 in. or less in diameter and of various shapes. Standard shapes are produced in three groups; namely, Group A, Group B and Group W. In any case, the wheel is securely and permanently mounted on the end of a steel spindle, mandrel or quill by cementing, or other means. In use, the spindle is held in a chuck on the end of the grinding machine spindle.

During recent years, a number of small high-speed grinders have been introduced for use with mounted wheels and points. These machines run at speeds up to 100,000 r.p.m., or more, to permit operation of even the smallest points at efficient surface speeds.

Few difficulties occurred from the use of high-speed equipment, but spindle failures have occurred—either by breaking off, or more frequently by bending. Under certain conditions excessive vibration proved troublesome. The study undertaken by the Grinding Wheel Manufacturers Association may be summarized as follows:

Two factors must be considered in determining the maximum safe operating speed: (1) the critical speed, and (2) the limit of wheel strength. Therefore it is essential to do three things:

1. Establish the safe percentage of critical speed.
2. Establish the maximum speed, based on limit of wheel strength.
3. Use whichever value is lower, as the maximum safe operating speed.

Critical Speeds

Every spindle with a wheel or point mounted thereon has a critical speed at which vibration tends to become excessive because of deflection or whip. This critical speed varies with the following conditions: (1) dimension of wheel, (2) diameter of spindle, and (3) the overhang, or distance from support to the base of the wheel. The critical speed of a spindle is not influenced by the type of steel used, the short taper and reduced diameter at the end when very small wheels are used, nor usually by the type of machine.

Accompanying tables indicate the critical speeds for various standard mounted wheels and points in combination with several standard spindle sizes and various overhangs. These are for smooth, *unthreaded* spindles.

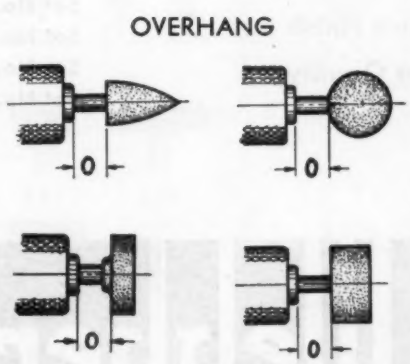
Rules for safe operation are as follows:

1. For smooth unthreaded spindles—not more than 85 percent, and preferably not more than 75 percent, of the critical speeds listed in the tables.
2. For ⅛-in. threaded spindles—not more than 55 percent and preferably not more than 50 percent, of listed critical speeds.
3. For ¼-in. threaded spindles—not more than 65 percent and preferably not more than 60 percent, of the listed critical speeds.

It may be found that a desired size of wheel or point will operate beyond the safe speed limit because the speed of the grinder cannot be reduced. In such cases, it may be possible to effect safe operation by reducing the overhang, choosing the next smallest wheel diameter, or selecting a wheel with the next larger diameter of spindle.

Maximum Operating Speed Based on Wheel Strength

Outside Diameter of Wheel Inches	Maximum Speed (r.p.m.)
¼	152,700
5/16	122,200
⅜	101,856
½	76,392
⅝	61,120
¾	50,928
⅞	43,648
1	38,196
1¼	30,560
1½	25,464
1¾	21,824
2	19,098



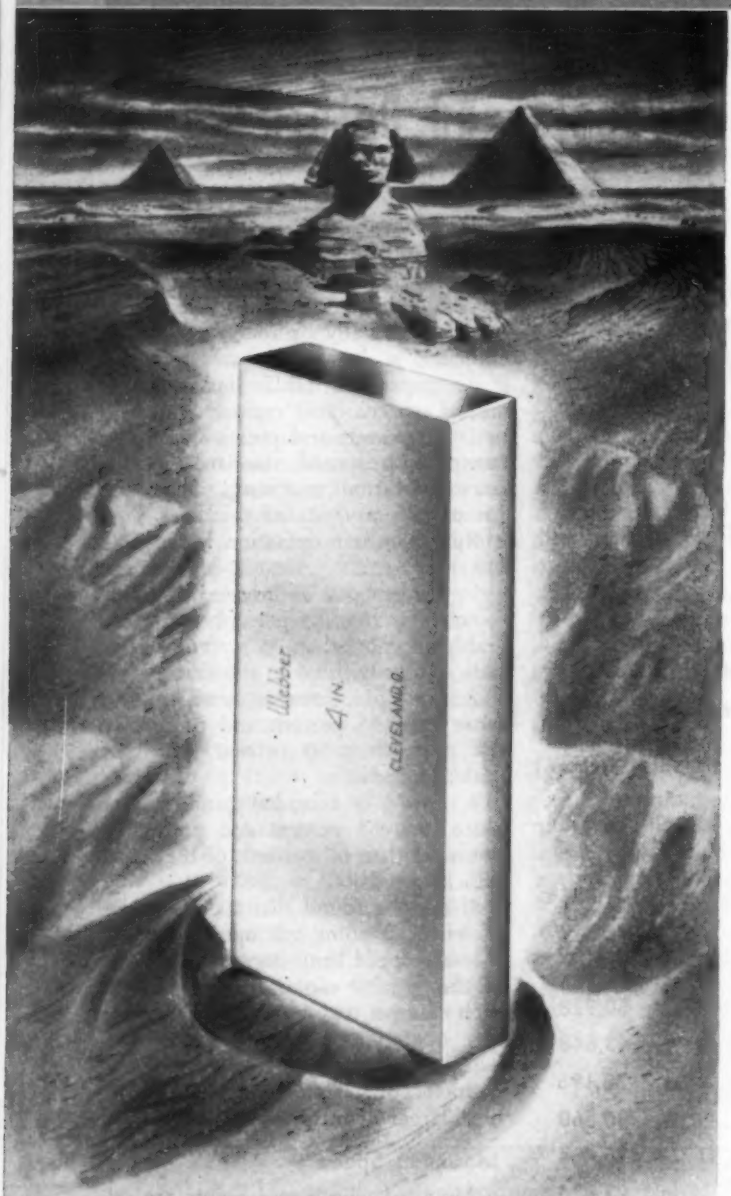
Maximum Speed

Mounted wheels and points are seldom made coarser than 60 grit. An accompanying table lists the maximum operating speed for various diameters of mounted wheels and points, based on wheels in average use. These speeds should not be exceeded, even though they are lower than the safe percentage of speed determined by the rules quoted under "Critical Speeds."

Work Pressure

Pressure between wheel and work should not be heavy enough to cause considerable springing of the spindle. Attention should be paid to this matter, particularly in connection with small wheels and points having the end of the mandrel reduced in diameter where it enters the wheel.

STABILITY { ONE OF THE 5 THINGS TO LOOK FOR WHEN YOU BUY GAGE BLOCKS



Look for these 5 things when you buy Gage Blocks –

1. Dimensional Accuracy
2. Stability
3. Surface Finish
4. Wearing Quality
5. Service after the sale

Stability in a gage block means the ability of the steel in the block to indefinitely retain exactly its original size. (Except as changed through normal wear and use).

Long years of experience are required to master the art of imparting absolute stability to steel. Webber Gage Co. has that experience and by means of special, highly secret, methods is producing gage blocks which are stable.

Here's Proof

The 4 inch Webber Gage Block, shown at the left, has been examined periodically by the National Bureau of Standards for nearly 15 years and shows no measurable change in size—that's STABILITY.

You know that the Webber Gage Blocks you buy today will never change their size for any reason except normal wear. You also know that Webber Gage Blocks provide precision measurements from the tool room to the production line.

Check the Webber Sets listed and pick the one best suited to your needs.

Set No. 84A	$350.00
Set No. 84B	$235.00
Set No. 43A	$185.00
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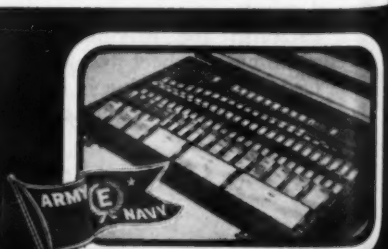


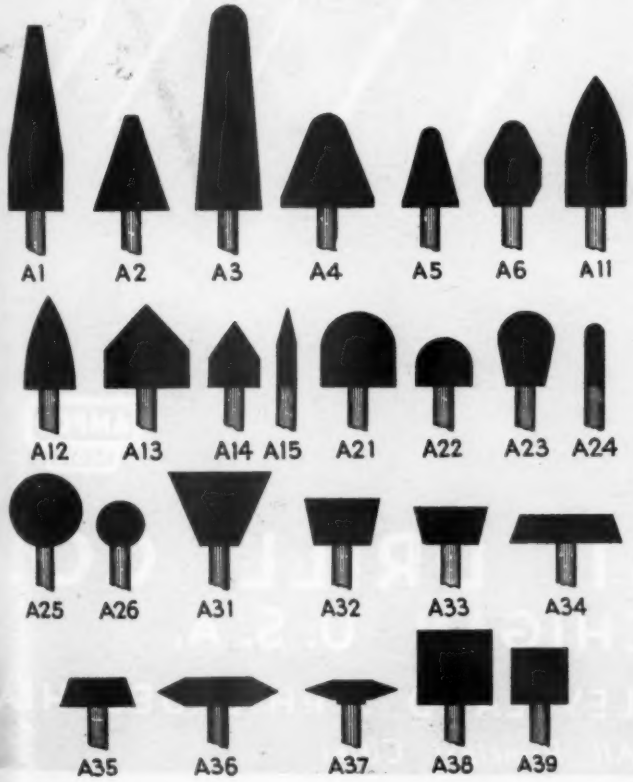
Safe Operation of Mounted Wheels and Points—II

Additional tables of critical speeds will be published in an early number.

GROUP A WHEELS · 1/4 IN. SPINDLES

Shape No.	Wheel Diam. Inches	Wheel Thickness Inches	Overhang—Dimension O					
			½"	1"	1½"	2"	2½"	3"
A 1	¾	2½	26,400	22,000	17,500	14,200	12,000	9,000
A 2	1	1½	59,000	43,500	34,000	27,500	22,500	18,000
A 3		2½	24,000	19,500	16,000	13,000	10,000	7,000
A 4	1¼	1¼	43,000	33,000	27,000	21,500	17,500	14,000
A 5	¾	1½	60,000	45,000	36,000	28,000	22,000	18,000
A 6	½	1½	52,000	39,600	32,000	25,300	20,000	16,000
A 11	½	1½	36,700	29,200	24,000	19,500	16,000	12,500
A 12	½	1¼	64,000	47,000	36,500	29,000	23,000	18,000
A 13	1½	1½	57,000	43,000	34,000	27,500	22,000	17,000
A 14	½	⅜	76,000	54,000	41,000	32,500	26,000	20,000
A 15	¾	1/16	97,000	63,500	46,000	35,000	26,500	18,500
A 21	1	1	46,000	35,000	28,000	23,000	18,500	14,500
A 22	¾	⅜	76,000	54,000	41,000	32,500	26,000	20,000
A 23	⅝	1	52,500	40,500	32,500	26,000	20,000	16,000
A 24	⅜	⅜	102,000	66,000	48,500	36,000	27,000	20,500
A 25	1	1	47,500	36,500	29,500	24,000	19,000	15,000
A 26	⅝	⅜	92,000	62,000	47,000	37,000	28,500	21,000
A 31	1⅜	1	45,000	35,000	28,000	23,000	18,000	14,500
A 32	1	⅝	72,000	52,000	40,000	32,000	25,200	20,000
A 33	1	½	72,000	52,000	40,000	32,000	25,200	20,000
A 34	1½	⅜	64,000	46,000	36,000	29,300	24,000	18,500
A 35	1	⅝	79,000	56,000	42,000	34,000	27,000	21,200
A 36	1½	⅝	64,000	45,000	35,500	29,000	23,500	18,500
A 37	1¼	¼	88,000	62,000	47,000	37,500	30,000	24,000
A 38	1	1	46,000	35,000	28,000	22,700	18,000	14,200
A 39	¾	¾	63,000	47,000	37,000	29,500	23,000	17,500

GROUP "A"—STANDARD SHAPES



Critical Speeds (r.p.m.) for Mounted Wheels

These are not safe operating speeds — See Part I

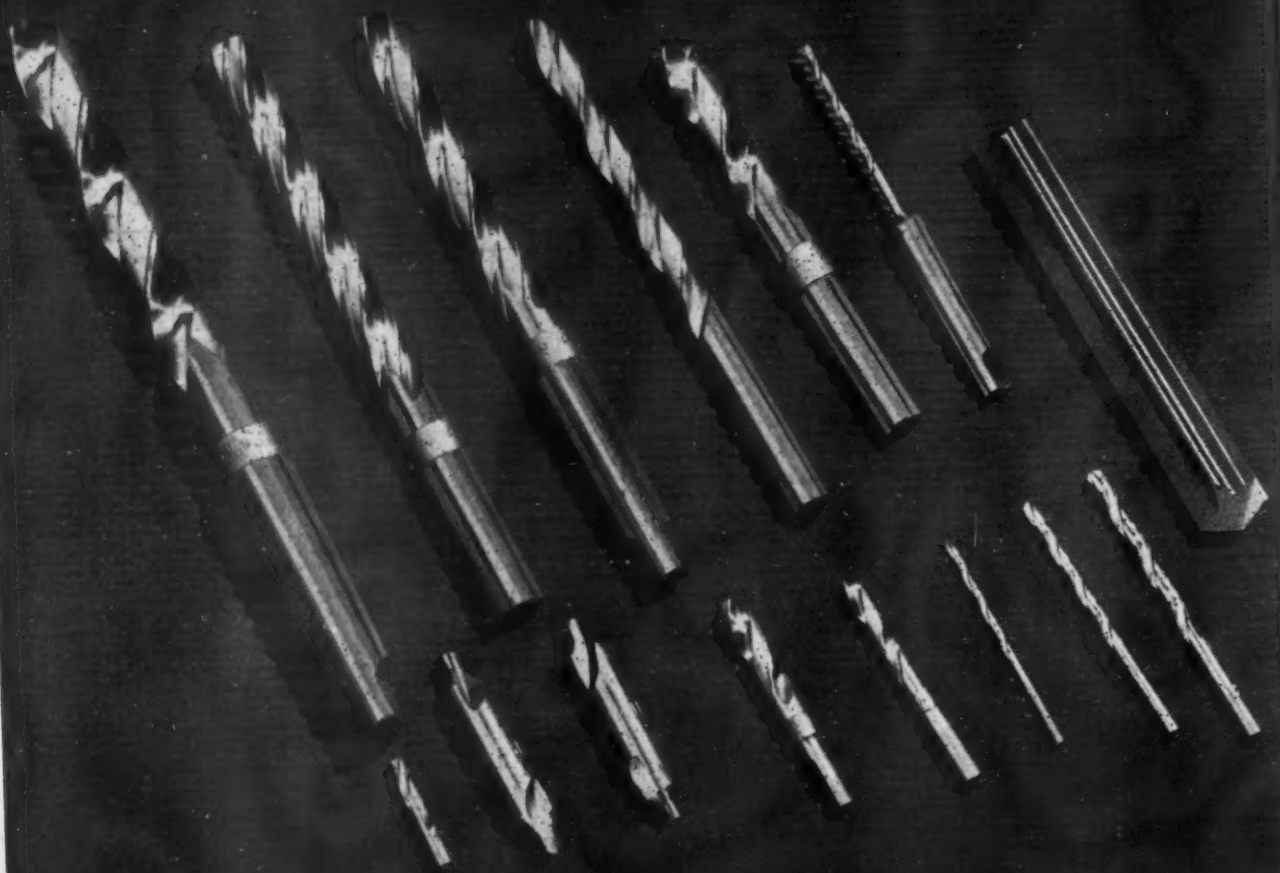
GROUP "W"—PLAIN SHAPES

GROUP W WHEELS · 1/8 IN. SPINDLES

Shape No.	Wheel Diam. Inches	Wheel Thickness Inches	Overhang—Dimension O				
			½"	1"	1½"	2"	2½"
W 143	1/16	1/16	140,000	86,000	62,200	43,200	28,500
W 144	1/16	1/8	140,000	86,000	62,200	43,200	28,500
W 145	1/16	3/16	140,000	86,000	62,200	43,200	28,500
W 146	1/16	1/2	140,000	86,000	62,200	43,200	28,500
W 151	1/8	1/16	140,000	86,000	62,200	43,200	28,500
W 152	1/8	1/8	140,000	86,000	62,200	43,200	28,500
W 153	1/8	3/16	107,800	70,000	50,000	35,000	23,500
W 154	1/8	1/2	94,000	60,800	42,000	29,300	20,300
W 157	1/16	1/8	164,000	87,500	63,700	44,200	29,000
W 158	1/16	1/16	140,000	86,000	62,200	43,200	28,500
W 159	1/16	1/8	123,200	76,500	52,500	37,200	25,200
W 160	1/16	1/4	108,500	68,000	45,500	32,000	22,500
W 161	1/16	1/8	103,000	61,300	41,200	30,000	21,500
W 162	1/16	1/8	91,200	56,500	38,500	27,800	20,000
W 163	1/16	1/8	80,000	50,700	35,000	25,000	18,500
W 164	1/16	1/4	61,200	40,000	29,000	21,200	15,800
W 165	1/8	1/8	143,200	83,300	55,000	39,000	27,000
W 166	1/8	1/8	129,300	76,000	47,500	33,500	24,000
W 167	1/8	1/8	100,000	61,000	41,500	30,000	21,000
W 168	1/8	1/8	91,200	55,700	38,200	28,000	20,000
W 169	1/8	3/16	82,200	50,300	36,000	26,500	19,000
W 170	1/8	1/8	70,000	44,000	30,700	22,200	16,800
W 171	1/8	1/4	49,500	34,000	25,000	19,500	14,700
W 172	3/16	1/8	132,500	79,000	54,700	39,000	27,000
W 173	3/16	3/16	116,800	71,000	47,000	33,000	23,000
W 174	3/16	1/4	92,000	55,000	37,000	27,200	20,000
W 175	3/16	3/8	72,000	44,000	32,200	24,000	18,000
W 176	3/16	1/16	60,500	38,000	28,000	21,200	16,200
W 177	3/16	1/4	45,000	31,000	23,500	18,200	13,800
W 178	3/16	1	35,000	25,000	19,000	14,500	11,000
W 181	1/4	1/8	115,000	74,000	49,000	34,000	23,800
W 182	1/4	1/4	98,000	58,200	38,800	27,700	20,600
W 183	1/4	1/4	69,000	42,500	30,000	23,000	17,200
W 184	1/4	3/8	54,700	35,200	26,000	20,000	15,200
W 185	1/4	1/16	46,000	30,000	22,500	17,500	13,200
W 186	1/4	1/4	35,000	23,200	17,000	13,000	10,700
W 187	1/4	1	27,500	18,500	13,500	10,500	8,500
W 190	5/16	1/8	106,000	64,000	42,000	30,200	22,500
W 191	5/16	1/8	78,500	46,000	33,500	25,200	19,000
W 192	5/16	1/4	57,500	36,500	26,500	20,300	15,500
W 193	5/16	3/8	47,000	30,700	22,000	16,700	13,000
W 194	5/16	1/16	39,200	25,500	18,000	14,000	11,000
W 195	5/16	1/4	29,500	19,000	13,500	10,200	8,200
W 196	5/16	1	23,500	15,500	10,800	8,200	6,800
W 199	3/8	1/8	101,800	59,700	40,000	29,000	21,000
W 200	3/8	1/8	73,200	44,700	31,800	23,800	17,800
W 201	3/8	1/4	51,000	32,500	23,200	17,700	13,300
W 202	3/8	3/8	40,800	26,000	18,000	13,500	10,400
W 203	3/8	1/16	34,000	21,200	14,500	11,000	8,800
W 204	3/8	1/4	25,200	16,000	11,200	8,300	7,000
W 210	1/4	1/8	80,000	47,000	34,300	25,200	19,100
W 211	1/4	1/8	60,800	37,200	27,200	21,100	16,300
W 212	1/4	1/4	45,000	27,200	19,200	14,700	12,000
W 213	1/4	3/8	36,000	22,500	15,000	11,000	8,800
W 215	1	1/16	54,800	33,200	24,000	18,500	14,000
W 216	1	1/4	40,700	24,800	17,000	12,700	10,000

TWIST DRILLS

IMMEDIATE STOCK DELIVERIES ON STANDARD DRILLS



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April orders for machine tools—$42,000,000, according to a preliminary estimate—exceed shipments for the first time since August, 1942. This represents a slight rise from $41,854,000 of orders in March. At the same time, April shipments were possibly a little off from March.

To Exceed Predictions

A resurgence of demand for machine tools for new war production programs has put the machine tool industry once again into the limelight. Just as Washington officialdom was writing off the industry as having completed its war job, the need for new machine tools will hold production at or near its current level of $50,000,000 a month probably for a number of months. March shipments were above February's, and April output is believed to have exceeded that in March. Instead of turning out $325,000,000 of machine tools this year, as earlier predicted, production will be nearer $500,000,000. On top of that figure must be put the volume of business done in subcontracting of direct war work.

Machine tools are wanted for the manufacture of large shell, from 105-mm. to 240-mm. The shell program has been stepped up very sharply, along with the program for heavy artillery. Big orders have been placed for shell-turning machines, with pressure being exerted for quick delivery dates. It is probable that some of the shell machines may be purchased in Canada if their deliveries can thus be expedited. Aircraft engine makers also are asking for much new plant equipment, particularly high-production, specially-designed machine tools. Russia is in the market with sizable orders for U. S. builders, at the same time awarding some machine tool business to Canadian companies.

Caught Off Balance

The sudden and unexpected request from Washington to turn on the production heat again has caught many machine tool builders at a disadvantage. Having taken on a considerable amount of direct war work at the government's urgence, having had its backlog dwindle steadily for well over a year, having lost many men to the services, and by necessity having had to cut operations, the industry has a major task on its hands to meet the new demands. Washington is asking the industry to handle the new situation by soliciting orders directly from contractors; no new pool orders will be permitted. The placing of pool orders was discontinued the middle of 1943. There is some belief within the industry that enough idle machines will be uncovered in war plants to justify the washing out of part of the orders already distributed and about to be awarded, thus the job ahead of machine tool builders is not so great as it looms at the moment. Washington is of the opinion, however, that the orders will stick and little relief will be found in existing machines yet to be disclosed as available.

Tool Orders Rise

Makers of special-purpose machines are exceptionally busy, but the fresh demands for machine tools are by no means confined to specialized groups. Builders of general-purpose equipment are deriving beneficial effects too, with delivery dates lengthening once again. Though some buyers are ready to give big orders to a single builder, Washington is spreading the business to insure speedier deliveries.

Components Are Easing

The components situation is getting better. Anti-friction bearings continue as the tightest spot of all, though improvement is evident. Orders for fractional horsepower motors still run months ahead. Steel production is being stimulated to new heights by the shell program. Demands are expected to be so severe in the months ahead, because of shell casings output, that other steel products, such as rail, structural steel and tube rounds, may have to be cut back.

To Up Shell Output

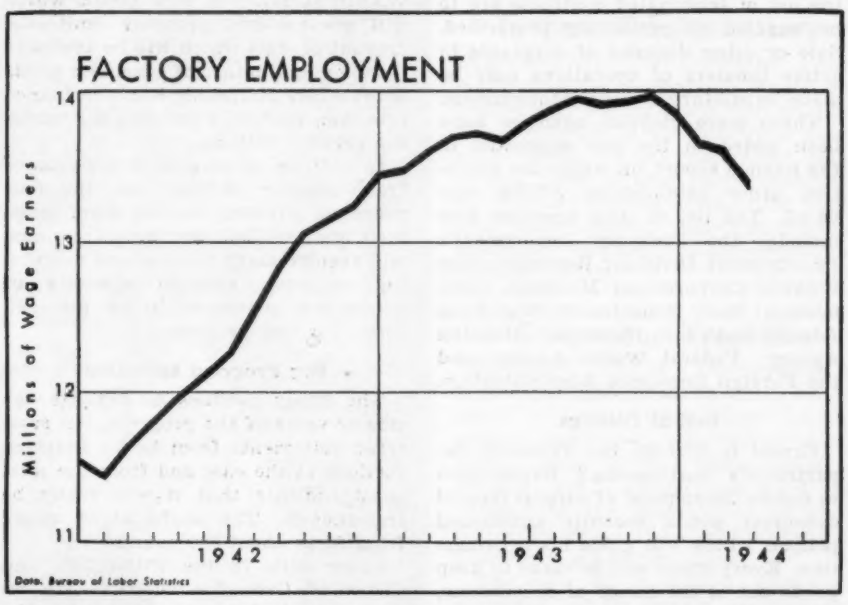
The war production program continues to stress certain items that have a top critical rating—landing craft, big bombers, rockets, large shell, heavy artillery, heavy trucks, communications equipment. The shell program calls for stepping up output not only here, but in Canada. For many months shell-making operations had been steadily scaled down.

Revisions Retard Planes

Plane building in April was considerably under March's total and May probably is no better. Shifts are being made to heavier models and production has leveled off in line with changing combat requirements. Output recently on the West Coast has been held down by revisions in the number of training planes to be delivered, by shortages of certain highly skilled personnel and by adverse weather.

Manpower Still Cuts Output

Production of war goods is still being hampered more by shortage of manpower than by any other single factor. In the Chicago area, for example, some 90,000 additional workers will be needed before September 1, and only 54,000 are in sight. In that area it is estimated that 44 percent of all adult women now are working.



Employment Declines—Some labor was released by cutbacks—as in small arms ammunition, but employment also fell off in such labor-short lines as lumber, textiles and food. Biggest drop came in war lines—machinery, autos, aircraft and shipbuilding—in part because efficiency improved, but also in part because workers were not available where needed, thus causing an arms output drop

Much of Overseas Surplus to be Sold There, Says SWPA

Quick declaration of surpluses urged. Military commanders may sell in war areas. Treasury, with $40,000,000 of consumer goods to move, to sell at ceiling in tested markets

WASHINGTON—Surplus War Property Administration Regulation 1, governing the declaration of surpluses held by the Army, Navy and Maritime Commission, has been issued by Administrator Will L. Clayton, establishing forms and procedures to be followed both by the owner and the disposal agency in transferring such goods between themselves.

Other federal agencies will ultimately come under the provisions of SWPA Reg. 1, Clayton said, but will for the present continue to handle their excess property under existing regulations.

Meanwhile, Clayton declared in an interview, much of the surplus which is overseas will ultimately be sold there to save shipping costs back to this country and to aid in supplying devastated areas.

The new regulation neither prescribes methods for disposal agencies to follow in redistributing surpluses to other federal agencies or in selling the goods, nor establishes financial or accounting responsibilities of the disposal agencies.

Urge Speedy Declaration

The three agencies primarily covered by the new regulation are urged to seek out and declare surpluses as promptly as possible, holding only those goods necessary for the prosecution of their programs. Surpluses arising out of terminated contracts are to be handled as previously prescribed. Sale or other disposal of surpluses in active theaters of operations may be made by military or naval commanders.

Three more disposal agencies have been added to the five suggested in the Baruch report, on which the executive order establishing SWPA was based. The list of such agencies now includes the Treasury Department's Procurement Division; Reconstruction Finance Corporation; Maritime Commission; Navy Department; War Food Administration; National Housing Agency; Federal Works Agency and the Foreign Economic Administration.

Sell at Ceilings

Ernest L. Olrichs, the Treasury Department's business-man importation to handle its disposal of surplus federal consumer goods, recently announced policies which will guide his organization. Every effort will be made to keep goods out of the hands of speculators, and goods will be sold at ceiling prices to manufacturers, jobbers or distributors, as seems best. Markets will be tested before sales and negotiated sales or bidding will be employed. Unacceptable bids will be declined. Currently, Treasury Procurement has between $35,000,000 and $40,000,000 worth of consumer goods to move.

Meanwhile, WPB's Used Equipment and Machinery Industry Advisory Committee has recommended organization of a joint group of manufacturers, dealers and government officials to assist in distributing surplus equipment and machinery. The industry committee pointed out that such a body would furnish the government, at no cost, a fund of experience and knowledge which would be invaluable in seeing that the government gets the most for its property.

It urged also that established trade channels be used in disposition and that every effort be made, before surplus government plants are dismantled, to fit them into post-war plans of their localities.

Any policy of adding storage charges to the price of surplus machinery would be contrary to normal business practice, the committee warned, suggesting instead a declining price scale which would move equipment which might otherwise not be sold.

THE DRAFT, BY CLASSES

Men Under 26: All physically fit men in this age group who are not approved for occupational deferment as irreplaceable on a form 42 special, filed with the state draft director, will be classified 1A. As many as 140,000 men may be so deferred.

Men Over 25 but Under 30: Those who qualify as necessary men in an essential activity will be deferred "for the time being," which is generally expected to be as long as six months. Local boards may broaden the existing War Manpower Commission list of essential activities.

Men 30 or Over: Those regularly engaged in an essential occupation "to remain in civilian life for an indefinite period" in a deferred classification. Little chance is seen that these will be called, if at all, before some time in the first half of 1945.

Men of all age groups, physically disqualified or qualified for limited service, may be deferred if engaged in an essential activity.

Rising Ordnance Demands Affect Manufacture of Civilian Goods

WASHINGTON—A new factor which will govern—and probably limit—the amount of steel which will be available for the manufacture of consumer goods is the Army's imposing heavy ordnance program, currently accelerating under top priority ratings.

In addition to the steel it will remove from possible civilian use, the new program, affecting the 155 mm., the 8-inch and the 240 mm. heavy cannon, will require much forging and machining capacity, sizeable amounts of which are scheduled to be installed solely for this program.

Big Program Indicated

The Army declines to indicate the size or value of the program, but scattered statements from heavy industry sections of the east and from the west coast indicate that it will really be tremendous. The shells alone range from 95 to about 350 pounds.

Some mills in the Pittsburgh and Cleveland Ordnance Districts are reported booked to capacity, with the monthly requirements in the latter district alone reported to be 55,000 tons. Although the program is understood to center in the Pittsburgh district, part of it will go to Chicago, part to Cleveland, a little to Cincinnati and other parts scattered from New York state's Watertown Arsenal to Henry Kaiser's Fontana, Cal., steel plant. Kaiser, printed reports say, has signed a $25,000,000 contract under which he will roll the billets and blooms at Fontana, do the rough forging in a new $8,000,000 annex there and ship the shells to Denver for final machining in a section of the Denver Ordnance Plant which he took over specifically for this program. He expects to use about 1,000 skilled machinists at Denver, according to reports from Ordnance officers there.

Weirton Steel, at Weirton, W. Va., is reported to get $3,000,000 worth of new facilities to finish 8-inch shells. These would be Weirton's first end products of the war. The Watertown Arsenal is scheduled to finish 240 mm. shells and gun tubes, and Frankford Arsenal in Philadelphia may get in on the program.

Gun Replacements High

Shells are by no means all the program, despite the recent military experience which has indicated expenditure of far vaster quantities of ammunition than had first been counted upon. The guns themselves and replacement tubes are pressing and will continue so for some time.

Report Form Designed to Simplify Renegotiation Procedure is Issued

WASHINGTON—Machine tool companies which did more than $500,000 worth of business with any of six federal war agencies in a fiscal year ended between last June 30 and last March 1 will be required to file a statement of their business with the War Contracts Price Adjustment Board, or the six agencies to which they have been assigned for renegotiaiton on or before June 1.

Also required to report by June 1, are tool builders who did more than $100,000 worth of business with any or all of the six agencies during a fiscal year ended before last June 30. Manufacturers who did $500,000 worth of business with any of the agencies during a fiscal year ended after last Feb. 29 will be required to report on or before the first day of the fourth month after the end of such fiscal year.

The six agencies are the War, Navy and Treasury departments, Maritime Commission, War Shipping Administration and the Reconstruction Finance Corporation. Included in RFC are four of its subsidiaries, Defense Plant Corp.; Defense Supplies Corp.; Rubber Reserve Co. and Metals Reserve Co.

The procedure is to screen out those companies whose profits are such as not to require actual renegotiation. The law sets no standard above which profits must be recaptured but rather charges the six agencies with renegotiating contracts so as to prevent excessive profits. Presumably, companies in this position will be given clearance soon after their position is decided.

Meanwhile, Commander E. H. Wagner, Jr., member of the Navy's Price Adjustment Board, said 1943 will stand on its own, and conditions which prevailed during that year will govern action by price adjustment boards. He suggested that contractor's claims be accompanied by better substantiation than they were last year.

Machinists Resume Work on West Coast Drydock Ships

SAN FRANCISCO—Seizure of struck San Francisco Bay shipyards and machine shops, which appeared imminent, seemed averted when CIO and AFL machinists, complying with repeated mandatory directives of the National War Labor Board and their own national leaders, resumed work on a cargo vessel at Moore Drydock Co., and a submarine net tender at Bethlehem Yard.

The National War Labor Board, which received the disputes when directives of local agencies were ignored, May 2 issued orders which: (1) Ruled that both CIO machinists in the East Bay and AFL machinists in San Francisco should be paid for work performed on new vessels in drydock at the new construction wage of $1.20 an hour instead of the $1.34 repair rate demanded by them, and (2) upheld the Regional War Labor Board in directing AFL machinists in San Francisco to lift their recent restrictions on overtime work in the 104 shops employing 5,000 men, pending settlement of a wage and working conditions dispute.

Despite national pleas to resume work on vessels and overtime in machine shops, the machinists remained adamant in their stand and appeared willing to comply only when instructed to do so by local union heads.

It was reported machinists were using the 48-hour week as a club to force employers in the California Metal Trades Association to sign a new contract guaranteeing on a retroactive basis a raise of 18 cents an hour, 2 weeks vacation pay yearly and 10 days annual sick leave.

Crane Dispatcher—Minute, motion-by-motion directions are furnished crane operators in the Boeing Aircraft Co. plant, through a carrier current telephone system connecting each crane with the dispatching office high above the operating area. Connection is through the lines which supply power to the cranes

NAMED DISPOSAL ADVISOR

WASHINGTON — A. G. Bryant, vice-president of the Cleereman Machine Tool Co. and chairman of the government relations committee of the National Machine Tool Builders' Association, has been named advisor on surplus machine tool disposal to the Reconstruction Finance Corp.

To Mark 50th Anniversary

CLEVELAND—The Cleveland Pneumatic Tool Co. is marking its fiftieth anniversary during the month of June. Practically all of its peacetime products, which include pneumatic tools, aircraft landing gear, shock absorbers for military rolling stock, rock drills and other mining and construction machinery, are being manufactured for the war effort.

Temperature-Proof Oil

RICHMOND, CALIF.—Development of a new type lubricating oil which can be made to ignore temperature change without altering its viscosity, or which can be made to thin when cooled or thicken when heated has been developed in the laboratories of California Research Corp., a Standard of California subsidiary, here.

The new oil is still a laboratory curiosity, but its further development, it is believed, may ultimately help solve the problem of lubricating equipment that is operated under wide temperature ranges. The aircraft industry is expected to be among the first to benefit through large scale production of a lubricant with these qualities.

Record NMTBA Meeting Discusses War and Postwar Plans

Production of some machine tools for postwar civilian use would allow machine tool industry to be ready on quick notice to meet sudden and varied demands of services

CLEVELAND—Both the immediate and future problems of the machine tool industry formed the basis of discussion at the spring meeting of the National Machine Tool Builders' Association at the Hotel Cleveland May 8-9. The best attended in the history of the association, the meeting departed from tradition in that the entire first day was devoted to group sessions and the entire second day was taken up by general sessions. The dinner on the first day was addressed by J. Norman Lodge, foreign correspondent, Associated Press, who described his experiences in the Pacific.

Mason Britton

At the dinner meeting Mason Britton, vice president of McGraw-Hill Publishing Co. was presented with a plaque as a tribute to his services to the nation on behalf of the war production program during his terms, first as chief of the Tool Section of the National Defense Advisory Commission, and later as chief of the Tools Branch, Office of Production Management.

One of the high spots of the meeting was the presentation by Harold T. Johnson, director of standards, General Motors Corp., of his critical appraisal of the usage and maintenance of machine tools that he previously had given to a limited number of machine tool builders attending a conference called at Detroit by the corporation (A. M., May 11, 1944, p. 120c).

Taking cognizance of the current unexpected increase in the demand for machine tools for war programs, James Y. Scott, president of the Van Norman Co. and president of the association, described the dilemma in which many companies find themselves because they have been told to step up their machine tool output at once, though they have important subcontracts for other war products and though pool orders will not be forthcoming. Mr Scott suggested that the solution is to permit the industry to begin the production of machine tools for some postwar civilian use. Such action would permit the industry to be ready on immediate notice to meet the sudden and varied demands of the services. At the same time it would allow makers of civilian goods to start reequipping today for postwar production and to prepare for after-war employment.

James Y. Scott

Mr. Scott pointed to the situation of General Motors which must have 30,000 machine tools to swing from war to peace, 3,000 of them being critical. He defined a critical tool as "one which cannot be replaced by any other type of machine tool and which must be in a production line in order to have that line function."

Would Prepare for Peace

Since it will be impossible after the war to keep all the industry's facilities occupied with manufacture of machine tools, Mr. Scott said that plans must be made now to cut down "our plants, facilities and operations to fit our estimate of the postwar demand" or to add to sales lines other products than machine tools. The consumer goods field has problems of its own, especially in selling and distribution, that machine tool builders know nothing about, nevertheless the nearer a new product is to the consumer field, the more it might help to offset the tremendous variations to which the machine tool industry is accustomed.

The machine tool of the future, predicted Mr. Scott, may be entirely different from today's product. The one thing that is worrying every corporation head is his cost of production after the war. It is not surprising, then, that the trend is toward process machine tools as against operational machine tools. The process machine tool takes a unit and moves it through a cycle of 20 or 30 different operations and turns out a finished product. The complete manufacturing process is done on that tool.

Mr. Scott emphasized that "the function of machine tools is that of cutting costs. How soon are we going to get back, once more, to the presentation of this fundamental principle? Cost-cutting is going to be just about the biggest problem in the entire industrial field." It is up to the machine tool industry to do so good a job of redesign and re-engineering that when the war is over American manufacturers can continue to pay high wages and at the same time put their products on the market at prices that the masses of people can afford.

The present conciliatory atmosphere in which discussion of renegotiation is being carried on between the Reconstruction Finance Corp. and representatives of the machine tool industry is refreshing by contrast with previous rebuffs by various renegotiation boards, stated A. G. Bryant, vice president of the Cleereman Machine Tool Co. and chairman of the government relations committee of the association, in one of the meeting's outstanding addresses. Mr. Bryant advised the industry that announcements regarding 1943 renegotiation procedure would not be made for several weeks. He said that conferences would be continued indefinitely with RFC to aid that agency in its avowed intention to develop a sound, equitable

A. G. Bryant

and satisfactory policy for renegotiating 1943 business "on a basis which will realistically permit machine tool builders to retain their reasonable earnings as essential future reserves."

Renegotiation will cost machine tool builders on 1942 business $54,000,000, said Mr. Bryant. Of that amount, $39,500,000 will be out of current net profits and $14,500,000 in reduction of postwar refunds. Without renegotiation, the industry would have paid federal taxes subject to postwar refund of $355,000,000, leaving a net profit of $87,000,000, or 6.6 percent of sales. With renegotiation the industry will pay $214,000,000 in federal taxes, leaving $48,000,000, or 3.6 percent of sales.

Mr. Bryant voiced concern over the fact that, without consultation with the industry, the State Department and Foreign Economic Administration had consented to the decision of the Australian government to allow Australian distributors of machine tools only three percent commission on machines shipped from the United States, whereas the regular discount permitted distributors importing British machine tools is 10 percent. He stressed the need for acquainting officials in charge of foreign policy with facts about the industry and its products so that they may operate in the interests of the industry and of the country.

Would Modernize Plants

Speedy disposal of machine tools as they become "surplus" and the use of surplus machines to bring United States manufacturing facilities up to date were advocated by William P. Kirk, vice president of Pratt & Whitney Division, Niles-Bement-Pond Co. and chairman of the planning committee of the association. He urged the government and American industry "to seize the great opportunity to renovate the factories of the United States. It would be the height of absurdity if our industry were to find its world leadership in machine tool design and production more keenly appreciated abroad than at home. It would be a tragedy if foreign nations rebuild their industries with the best of modern equipment while we treasure in our production lines the venerable relics of a by-gone age."

William P. Kirk

The most important consideration, said Mr. Kirk, is the retention of an adequate capacity for producing weapons in another national emergency. The armed services must decide what plants, what arsenals and what equipment in dead storage must be retained so that we will never again be caught napping. Old machines must be replaced by the newer ones in the arsenals. Another consideration is to use surplus machines to improve the country's manufacturing efficiency. That is more important than rebuilding the shattered industries of devastated countries.

Urges Simplified Pricing

Mr. Kirk asserted that a simple method of selling surplus machines must be established. Appraisal of machines must be avoided, because it is a slow process and skilled men to do it are not available. Prices should be based merely on the original price minus a discount for the number of months since shipment from the factory. The planning committee has suggested a discount of 25 percent plus one percent each added month of the machine's age, with a maximum discount of 55 percent for machines two and one-half years old or older.

A strong recommendation was made by Walter K. Bailey, vice president of the Warner & Swasey Co. and chairman of the committee on sales and service, that machine tool builders, individually or in groups, make a careful study of postwar demand and of the sales and service problems arising from that demand as it affects their particular machines. Mr. Bailey said that "we should pound home to our present sales personnel the idea that once this war is over, they won't be selling delivery dates, they won't be selling machines, they will be selling the ability to cut manufacturing costs. We are not in the machine tool business, but that of enabling more people to get better things for less."

Stresses Basic Design

In redesigning our machine tools, recommended Mr. Bailey, the builder should not pay too much attention to secondary items such as floor space, streamlining, control of operations, electrical devices, chromium knobs, special gears and gadgets. These things are of no value in and of themselves, but only so far as they enable manufacturers to cut manufacturing costs. The only sound approach to machine tool redesign is the market.

Speaking on the price situation, William F. Kelly, price executive, machinery branch, Office of Price Administration, Washington, said that if OPA is to take action with reasonable promptness on machine tool industry problems, builders must keep OPA supplied with current financial and cost data. Mr. Kelly explained the policies of his office and asked for recognition that OPA is dealing "in fairness and equity." He paid tribute to the fine work of the industry advisory committee under the leadership of Phil Huber, Ex-Cell-O Corp., president.

Walter K. Bailey

Tell Berna, general manager of the association, reported on the various problems affecting the industry, quoting at length the comments of Adolph Foerster of the Foreign Economic Administration on England's preparations for postwar machine tool business. He stressed that proper handling of contract terminations is necessary if we hope to maintain employment, give jobs to returning soldiers and insure the solvency of contractors.

Machine tool builders must keep their output of machine tools where it is and maintain their schedules of non-machine-tool goods, stated John S. Chafee, director, tools division, WPB. He emphasized statements made in a letter of May 2 to the industry that schedules for machine tool production are made only by WPB and are not formed on the basis of requests from the services themselves.

Mr. Chafee said that authorization for the filling of machine tool orders for postwar tooling of plants will be given as quickly as the national interest permits, but warned that the time is not yet here. He stressed the desirability of distributing machine tool orders throughout the industry so as to expedite producton rather than have them accumulate in the hands of selected companies. Despite requests for relaxation of the order restricting builders to the use of so-called war finishes on their machines, the time is not here to grant such requests. Mr. Chafee remarked that anti-friction bearings will be critical in spots for some time though improvement is noted in the over-all situation.

Robert R. Stevens, St. Louis machine tool distributor representing the Ordnance Department of the Army, told about the proposed shell and heavy artillery program and solicited the help of the industry.

As Peacetime Output Nears, UK Exports to Russia and Empire

CLEVELAND—The United Kingdom is now self-sufficient on most standard types of machine tools, but there will be a continuing demand on the United States for special and specialized machines. These opinions were expressed in a report prepared by Adolph Foerster of the Cincinnati Milling Machine Company, who has served in London for some time with the Foreign Economic Administration, and read at the recent spring meeting of the National Machine Tool Builders' Association.

Based on these observations, Mr. Foerster feels that machine tool production in the United Kingdom is rapidly approaching a peacetime pattern, although volume will be over double the 1937 value. People employed in the industry by the end of 1944 will be almost exactly the same as the number employed in 1937.

"I feel," Mr. Foerster said, "that the British consider the maintenance of a sound, well-balanced machine tool industry a very important matter. For this reason, I feel that the British will continue their controls into the postwar period, taking the machine tool industry at a prewar pattern and reducing the output to whatever output volume is considered necessary to maintain the industry. The output of machine tools at this level will probably be considered as part of the government pool of machine tools already in existance at that time and allocations made from this pool to industry or to fulfill requirements in liberated areas or export markets."

According to Mr. Foerster, the United Kingdom is exporting machine tools, but only to Russia and British Empire countries. Machine tool control in England will not grant a purchase certificate for a machine tool or an export license, except on "Russian-Protocol-Commitments," without having received agreement of the United States Mission for Economic Affairs in London that the United Kingdom is a preferable source of supply for the particular requirement. The determination is made on purely practical grounds, and the availability in the United Kingdom, shipping considerations, and whether or not the United Kingdom is concurrently importing similar types of machines.

The problem of machine tool requirements in liberated areas is said to have been considered in London and requirements assessed for the first six months period after military occupation. Such tools would be used for repair and maintenance. Allied government representatives specified how many of each unit they would probably require, and the results of these estimates were summarized and then related to the estimated total machine tool holdings in each country prewar.

BLIND PROVE WORTH

LONDON—British experience has proven that, with simplified controls, tool-setting done for them, and natural positions arranged for picking up and putting down workpieces, the blind are quite competent in the handling of machine tools. It is not unusual for blind operators in industry to surpass in output those with full facilities partly because they are not so easily distracted from their work. Naturally, processes in production work have to be broken up to simplify them for the blind, as for the ordinary unskilled or semi-skilled worker, but some blind operators have shown they could advance to more complicated operators, given the opportunity.

Know-How and Capacity Draw More Orders to Labor-Tight Pittsburgh

PITTSBURGH — Additional machine tools and equipment to be installed in local plants in the next four to six months will be almost as great as the expansion in these lines in the past two years, ordnance officers say.

The allocation to Pittsburgh industry of an unexpected number of orders for heavy artillery, heavy shells and landing craft was made, despite scarcity of labor here, on the grounds that this is the only area with plant capacity and management capable of producing these weapons; this is the explanation made by Patrick T. Fagan, War Manpower Commission area director.

In an effort to escape the mandatory 48-hour week, which would mean an end of new contracts to mills that can't handle the work with present personnel, WMC is cracking down on employers—mostly in non-essential industries which are not permitted to hire males for replacements—who are chiseling on Pittsburgh's labor rationing program. Under this plan, only war and essential industries are allowed to hire full-time male employees, but WMC is considering a proposal to ration women workers also, to prevent "non-essential" employers from grabbing up the type of female labor needed in war industry.

Longer Week is Credited

The 48-hour week in the steel industry is credited by the WMC with saving 47,300 men, who were made available for the armed forces or to other war industries. Chances are, very few skilled workers were released to other trades, but the longer week permitted the nation's steel industry to take up the slack resulting from employees going into the armed forces. The WMC estimate is based on a comparison of the number of men employed in March, 1943—before the 48-hour week became effective May 1, 1943—and the number required for the same number of worker hours in January, 1944.

Chilly Checker — That U. S. Army and Navy fighting planes may have no failure under frigid conditions, aircraft engine starters produced at the Eclipse-Pioneer division, Bendix Aviation Corp., must pass a rigid series of performance tests, including check-up in an icebox which simulates sub-zero weather and helps determine correct lubricants

Inside Detroit

BY SILER FREEMAN

Union Fight Continues

The auto industry promises to be the battleground in a fight to the finish between management and the foremen's union. Despite the Ford Company's capitulation in signing a contract with the Foremen's Association of America on May 9, making the FAA the bargaining agent for the supervisory forces, the rest of the industry has come out flatly for a showdown and has taken the case to Congress and the President.

The immediate effect of the Ford Co.'s action was to bring a sharp challenge from Alvan Macauley, president of the Automotive Council for War Production, representing 550 established companies employing 1,200,000 workers and producing 20 percent of the nation's war goods. Macauley, speaking for the Council, charged that union leaders were attempting to unionize management, beginning with the foremen.

As Macauley put it, the clear-cut issue before the nation is, Can union leaders unionize management and take control of war production? Will they be allowed to disrupt production?

See Output Endangered

Speaking for the Council, Macauley has urged the Congress to clarify the status of management. Unless Congress does act, he predicted the crisis would thwart production efforts.

The Council's action is the latest move by industry in combating the rising tide of the foremen's union. It is not so much directed to war production as it is in the postwar period to whch industry looks ahead. As the largest manufacturing industry in the country, it sees the unionization of the foremen as offering an obstacle to prompt reconversion.

The FAA is a young organization but with a turbulent history. It goes back to September 1941 when Robert Keyes, a Ford foreman, founded it at the Rouge plant. The foremen termed themselves "the forgotten men of American industry." It became a national organization in March 1943, when Keyes was installed as the first national president. Other salaried officers included William Fisher, secretary-treasurer and Harold M. Kelley, membership director.

Has Grown Steadily

The FAA since then has been fighting to gain recognition from the NLRB and the WLB. It was turned down time and again and in July 1943 was rebuffed by a 2 to 1 decision of the NLRB which dismissed its petition to be certified as the appropriate bargaining agency for foremen and general foremen employed by Detroit Diesel division of General Motors. Nevertheless the foremen's union has grown. It now claims 25,000 members in 81 companies, most of them in the Detroit area.

It has shown its strength on numerous occasions in sporadic strikes, one of which hit production at Willow Run hard last December. It won an NLRB election at Packard in February 1943, but the company refused to deal with the union and the effect of the election was lost.

But last month, the union began agitation again. It closed plant after plant over alleged grievances and failure of the companies to give them attention. Up to May 10, it had called out 3,300 members in seven large war plants and production was feeling the effects.

The success of the FAA with the Ford Co. was preceded by an NLRB decision which allowed the foremen to organize under the Wagner Act. But it did not force the manufacturers to bargain with the union.

Ford Led Field

The Ford Co.'s decision to enter into a contract with the FAA set another industrial precedent for the company. It was the first big automotive firm to sign a closed shop contract with a union, after bitterly fighting the efforts of the UAW to organize its workers.

The contract with the FAA did not go as far as the UAW deal. It did not give the foremen the closed shop or the check-off, the two clauses that amazed the industrial world when it was first announced. But it gave them a big entering wedge and a good argument against the other automotive companies.

The immediate reaction was the move by the Automotive Council to get the government busy. A year ago C. E. Wilson, president of General Motors, took similar steps to halt the FAA. He appealed to Congress to pass a pending bill which would have banned the group, charging that such a union would lead to "industrial anarchy." The bill was never passed.

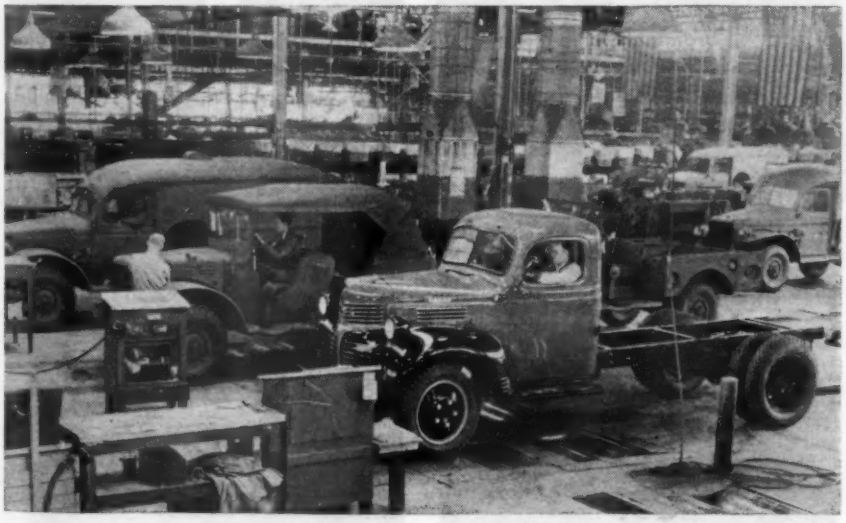
It's an Indicator

Industry the nation over will watch this death struggle. If the FAA succeeds in getting bargaining rights with the automotive companies, the next step will go into every other manufacturing company and organize the supervisory force.

The FAA has always declared itself an "independent union" which does not desire to affiliate with any other group. The UAW-CIO similarly has disclaimed any intention of trying to get the foremen into its fold. R. J. Thomas, president of the UAW, has frankly opposed any such tieup. Other union factions are not so emphatic.

The battle looms as a bitter one. Industrialists like Macauley and Wilson will not stand by and see the foremen sit on labor's side of the table. Wilson has always been critical of labor's attempts to have a voice in management, even to early opposition to labor-management groups.

Industrial history is in the making in Detroit. It may leave its mark on industry all over the nation.



Side by Side—The first new 1944 commercial truck, a 1½-ton chassis and cab, comes off the line alongside two Dodge army trucks. Limited production, under governmental order, has been going on since April 3. Although basically of the same design as the 1942 prewar models, a number of improvements permissible under W.P.B. material allotments have been made

Personalities at Westinghouse Tool Electrification Forum

L. to r., E. L. Spray, assistant to the president and F. D. Newbury, vice president, both of Westinghouse Elec. & Mfg. Co., W. P. Kirk, vice president and sales manager, Pratt & Whitney Div., Niles-Bement-Pond, and John E. Lovely, vice president, Jones & Lamson Machine Co.

In the usual sequence, G. H. Garcelon, manager, control engineering section, C. B. Stainback, manager, industrial department and W. P. Kelly, negotiation supervisor, motor division, Westinghouse Electric & Mfg. Co., and L. W. Scott Alter, president, American Tool Works Co.

Tell Berna, gen. mgr., National Machine Tool Builders' Assn., and J. C. Carlton, president and gen. mgr., Carlton Machine Tool Co.

Dr. H. A. Frommelt, director of research, Kearney & Trecker Corp., and Warner Seely, secretary, Warner & Swasey Co.

Thomas I. Phillips, Westinghouse vice president and James Y. Scott, president, National Machine Tool Builders' Assn. and of Van Norman Co.

Still in the same order, Edward Gangware, Westinghouse director of equipment, and F. R. Harris, Caterpillar Tractor Co. tool supt.

L. L. Schauer, chief engineer, Cincinnati Bickford Tool Co., and George H. Cherrington, president, Brown & Zortman Machinery Co.

Fred W. Lucht, development engineer, Carboloy Company, and B. P. Graves, director of design, Brown & Sharpe Mfg. Co.

Wartime Washington

Taxers Hopes Toppled

The hopes of states and counties of collecting taxes on $7,500,000,000 worth of war equipment and machine tools owned by the federal government but leased to private industry, was given a blow by a recent U. S. Supreme Court ruling.

The precedent-setting decision, holding that government-owned property is constitutionally immune from taxation whether the impost is directed against the government itself or someone leasing the property, reversed a Pennsylvania State Supreme Court decision in a case involving the Mesta Machine Co.

Allegheny County (Pittsburgh) sought to collect $5,137 in taxes annually on $618,000 worth of machinery owned by the government but leased to Mesta for use in an ordnance plant. If the county had been successful in making the tax stick, other counties all over the country likely would have taxed a total of $2,000,000,000 of government equipment located on privately owned land, and an additional $5,500,000,000 of such machinery located on government land being operated by private contractors.

Despite Labor's Efforts

The Senate beat off attempts by organized labor to tack onto the George-Murray contract termination and plant clearance bill its complete program for demobilization, severance pay, surplus distribution and termination, and passed unanimously the "first step" measure to get the reconversion ball rolling.

The George-Murray measure, product of the Senate's Post-War Economic, Policy and Planning Committee, headed by Sen. Walter George, Georgia Democrat, had been attacked by national officers of several labor groups as a piecemeal approach to the post-war problem and unmindful of the "human side" of reconversion. Sen. Harley M. Kilgore attempted unsuccessfully to amend the bill to include labor's entire reconversion program.

Senator James E. Murray, Montana Democrat, assured the upper house that further legislation to deal with surplus distribution and other problems would be laid before it as soon as possible.

The George-Murray bill is now before the House.

Only the Most Needed

Dr. William Y. Elliott, former director of WPB's stockpiling and transportation Division and before that a professor at Harvard University, has replaced Arthur D. Whiteside as director of WPB's Office of Civilian Requirements.

As OCR director, Elliott will be a vice-chairman of WPB and will have responsibility for planning and scheduling consumer goods production. Elliott said the second consideration in the nation's production must be "immediate production of more of the most-needed civilian goods," but warned that no "ordinary" civilian program which would interfere with military output could be started.

Flexible Plan Outlined

Meanwhile, WPB released its memorandum 42-A, replacing the ill-fated Memorandum 42 which flatly forbade civilian production in Group I or II labor shortage areas at a rate higher than that authorized or achieved in the first quarter of 1941.

The new program, accordng to WPB chief Donald M. Nelson, authorizes civilian production in plants employing less than 100 workers. Civilian producton will be placed as far as possible in plants located in Group III or IV labor areas. Parts of civilian programs will go to Group II areas wherever possible without hampering war output. Nelson continued that the plan is sufficiently flexible to allow such output even in the tightest areas . . . Group I . . . where it is clear that the war will not suffer.

Small Plants Exempted

The new memorandum specifically prohibits resumption or expansion of production in any Group I area except after clearance with WPB or its regional staff, but specifically exempted are plants employing fewer than 100 workers, or, within the west coast area, fewer than 50.

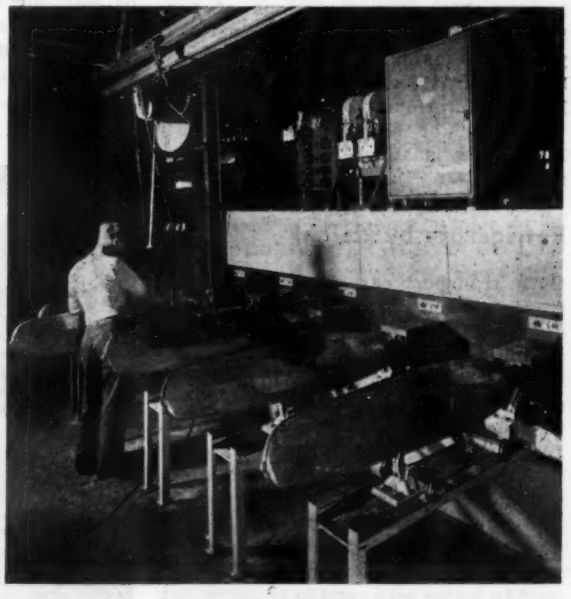
OCR wants immediate production on at least 10 consumer articles which it claims are as urgent as some militiary products. Included in this list are commercial laundry facilities, radio tubes, work gloves, leather tanning facilities and dry-cell batteries.

Bearings are Critical

WPB has halted new applications of radial-type bearings manufactured by the Miniature Precision Bearing Company because of the critical supply situation. The direction to Table 12 of order M-293 affects bearings numbered 2, 2½, 3, 4, 5, NM4 or NM5.

Meanwhile, producers of anti-friction bearings told WPB every effort will be made to boost to one month's supply the inventory of finished bearings, now sufficient only for two weeks. Any such increase would enable the industry better to meet emergency demands upon it.

Precision ball bearings continue as one of the most critical components, WPB's Tools Division reported recently. Deliveries of small bearings have improved within recent weeks, but deliveries of medium and heavy bearings, of 30 to 170 mm. outside diameter, are well short of demand. These scarce bearings are in particular demand for the landing craft program which the Navy is pushing under top priorites.



Comfortable Heat—Propeller blades at Chevrolet's Saginaw aluminum forge plant come from this five-station induction heater every 47½ sec. with hubs at 800 F. for upsetting and attaching thrust bearings. A 200-kw, 3,000-cycle, 500-amp. at 400 v. motor-generator set is used. Minimum heat in the working area, uniform temperature in the hub, and increased production have resulted

Deliveries of bearings for airframes, engines and propellers have improved lately, but those for aircraft accessories continue tight.

Large roller bearings for lathes involved in the heavy artillery and ammunition programs and for marine propulsion equipment also are tight.

Manpower Limits Bearings

Shipments of heavy and medium ball bearings exceeded new orders during last February and March for the first time in nine months, but the backlog built up during 1943 remained at about eight months production on April 1, the Tool Division reported. Manpower is the principal difficulty in production of these bearings, since facilities are adequate.

Spotting the Air News

Rates, the Determinant

Future of air transport depends almost entirely upon reduction of the present 50-cents-per-ton-mile cargo rate. Before the war the airlines had about 350 airplanes operating in their system. Normal increase of mail, passengers and express might push that fleet up to 1,000 planes shortly after the war—a mere bagatelle to the swollen aircraft industry. But if cargo rates could be pulled down to a point where the public could develop a taste for field-ripened fruits and fresh vegetables, and other goods wanted in a hurry, the airline fleet might reach impressive proportions.

Fifteen cents per ton mile is the surprisingly low rate achieved by the Navy's Air Transport Service, operating the 70-ton Martin *Mars* seaplane between San Francisco and Hawaii, according to the ship's builder, Glenn Martin. New cargo versions of the *Mars*, which was designed several years ago as a patrol bomber, will bring the rate down to ten cents, says Mr. Martin. He states that the rail express cost of shipping frozen foods 1,000 miles is about 16 cents per ton mile.

Refrigerate by Height

Air transport can climb up to subfreezing temperatures quickly, and does not need refrigeration. Leading airline executives are privately bearish on the prospects for volume food shipments. They will say right back to you: How about cargo for your return trip? That blows your rate up double. There is always a large bunch of experts wrong about anything. If Martin is right, the prospect for production of transport aircraft is looking better. (Note: Flying boats can land in water all over the country, but are out of luck when it freezes.)

Peace Will Determine

By long odds the biggest prospective market for airplanes in the immediate postwar period is the armed forces of this and other countries. The Woodrum Committee on Post-War Military Policy is studying the need for future military power, and is displaying special interest in aviation. The committee has been given all sorts of estimates on needed U. S. air power—as high as 50,000 planes, compared with 4,000 before the war. But of course the committee can only draw plans. No decisions can be taken until the government sees what sort of peace follows the war. Incidentally, proposals for the unification of land, air and sea forces under one Department of War are strongly supported by the War Department, by many congressmen, and by a large section of the public. The personal opposition of Navy Secretary James V. Forrestal may be outweighed by other opinion in the Navy. Chances are that complete action on unification could not come till after the war.

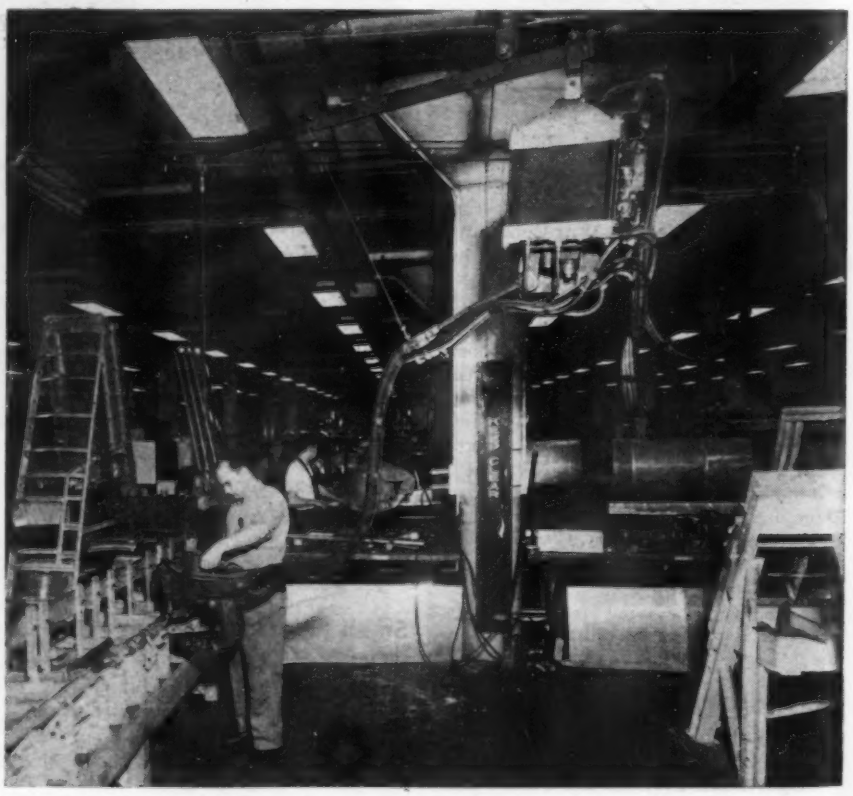
ACC to Rise

The Aeronautical Chamber of Commerce has been rehabilitated, with Eugene E. Wilson, vice chairman of United Aircraft, as chairman of its Board of Governors. The Chamber, which was shelved a couple of years ago, mainly because it was not suited to function as a liaison agent in wartime, will now speak for the industry on legislation dealing with disposition of war surplus aircraft, government-owned aircraft plants and tools, and on the termination of contracts. Representing the industry before the Administration during the war has been the Aircraft War Production councils, which were set up for *cooperation* between the aircraft producing units, and not for *competition*. Functions of the councils, which bordered on violation of the antitrust laws, will be tapered off as functions of the Chamber expand. The Aero Chamber of Commerce (officials would like to change its regrettable name) faces a stormy future of conflict between the airframe, engine, and propeller groups, and between the automobile and aircraft people. A large number of makers of spark plugs, nuts and gadgets, are not wanted in the Chamber, but they nettle the big boys if left out.

Notes for the Book

What will the aircraft engine people do if, in future years, jet power should be generally adopted? They probably will make the best jet engines. At least one of them started experiments long before the Whittle success that was taken over by Bell Aircraft. Dollar volume of the engine industry would drop far down; a jet unit is in a class with stoves and furnaces, except for the turbine compresser unit.

Henry J. Kaiser has his eye on one or more builders of light airplanes; he wants to finance a project and he has a scheme to put the same air-cooled engine in cars and planes, cutting cost from about $350 per engine to about $100.



On the Spot—The production of B-26 bomb bay doors at The Glenn L. Martin Company has been simplified, the number of operations halved and the time required reduced more than 50 percent with the introduction of a portable spotwelder to tackweld parts together in the assembly fixture

Names in the News

R. A. Neal John H. Ashbaugh

Four new vice presidents have been elected at Westinghouse Electric & Mfg. Co. including: **R. A. Neal,** former manager of the switchgear division at the East Pittsburgh works, who becomes sales manager as well as vice president; **H. H. Rogge,** who will continue to make his headquarters in Washington, having been manager of the company's Washington government office; **John H. Ashbaugh,** manager of the Westinghouse Electric Appliance Division, Mansfield, Ohio and **J. K. B. Hare,** manager of the company's central district sales activities with headquarters in Pittsburgh, will retain their former duties in their new positions.

Howard L. Dawson has been named chief industrial engineer for the Carnegie-Illinois Steel Corp. to succeed **L. J. King,** who has been transferred to the U. S. Steel Corp. of Delaware. Having been with the company since 1912 when he started at the Edgar Thompson Works, Mr. Dawson was appointed assistant chief engineer for the company last July.

R. T. Reilly has been named president of the Conly Frog and Switch Co. to succeed the late **John E. Conley.** Mr. Reilly, until this present appointment, was executive vice president of the company.

Paul F. Mumma, former assistant general superintendent at the Ellwood Works of the National Tube Co., has been named general superintendent of that plant. He succeeds **Leo J. Mason,** who has been elected vice president of the Tubular Alloy Steel Corp. at Gary, Ind., after four years in his former position. Mr. Mason is replacing **E. N. Sanders,** who has spent 20 months in organizing the new Tubular Alloy plant at Gary and is now returning to his original position as vice president in charge of operations at the National Tube Co.

Robert H. Aborn, a member of the laboratory staff since 1930, has been appointed supervisor of physical metallurgy at the research laboratory of the United States Steel Corp. at Kearny, N. J. Dr. Aborn, in 1941, received the Lincoln Gold Medal award of the American Welding Society.

Edward T. Nahill has recently been appointed sales manager of the Ace Manufacturing Corp., Philadelphia. Prior to his association with the Ace Corp., Mr. Nahill was connected with the General Electric Co.

James E. Sellers, former chief engineer of the WPB, has been named engineering consultant for the research division of the Plastics Industries Technical Institute. Mr. Sellers was at one time vice president of Amboy Chemical and a member of several engineering societies.

W. O. Everling

W. O. Everling has been appointed director of research of the American Steel & Wire Co. to succeed **J. S. Richards,** deceased. **R. H. Barnes,** who has been with American Steel & Wire for the last 24 years, has been named assistant director of research, the position which Mr. Everling has held for the past four years. Mr. Everling has held several positions in the company since he joined it in 1930.

Felix N. Williams, former production manager of the Phosphate Division of the Monsanto Chemical Co., was recently made general manager of the company's Plastics Division at Springfield, Mass. Mr. Williams, who succeeds the late John C. Brooks in this position, has been with the Monsanto Company for 20 years, having served the firm in numerous capacities.

R. L. Irvin, for nine years industrial manager of Westinghouse Electric & Mfg. Company's northwestern district, was recently named application manager of the Small Motor Division of the company at Lima, Ohio. Mr. Irvin has been with Westinghouse since 1911 and has been connected with the company's sales departments in East Pittsburgh, Pa., Chicago, Davenport, Iowa, and Minneapolis, Minn.

Henry Ford II, executive vice president of the Ford Motor Co., has been elected to succeed **Charles E. Sorenson** on the Board of Directors of the Automotive Council for War Production.

Paul T. Farrell, a member of the Great Lakes Steel Corp. since its formation, has been appointed to the newly-created position of assistant to the president of the Stran-Steel Division with headquarters in Washington, D. C. Mr. Farrell has been director of purchases for Great Lakes and all its divisions since 1942 until his present appointment.

Edward N. Haas, a member of the company since 1911, has been appointed works manager of the Aurora, Illinois plant of the Independent Pneumatic Tool Co. to succeed **W. H. Brewer,** who has been named general factory manager.

Alvin Zwerneman of the Axelson Manufacturing Co. has been named vice president and general sales manager of that company. He is returning to this position from Washington, where for nine months he has been affiliated with the PAW. Prior to his work in Washington, Mr. Zwerneman had been associated with Axelson for 20 years and had risen to the position of vice president in charge of sales for California and the Rocky Mountain division.

Edmund S. Davenport, a member of the United States Steel Research Laboratories in Kearny, N. J., since 1929, has been appointed assistant to Vice President R. E. Zimmerman, in charge of research and technology for the company.

L. C. Hatch has been appointed manager of the winch and crane division of Gar Wood Industries, Inc., to succeed **G. E. Robinson,** who has retired. Mr. Hatch has been with the Gar Wood Industries for the past ten years.

Eugene J. Reardon

Eugene J. Reardon has been named chief engineer of the American Steel & Wire Co. to succeed **George H. Rose,** recently appointed assistant to the vice president of that company. Mr. Rose has spent the last seven of his 39 years at American Steel & Wire as chief engineer. Mr. Reardon has been his assistant since 1942, having previously held numerous positions in the various company branches since joining American Steel & Wire in 1922.

BUSINESS ITEMS

The Dallas Division of Revere Copper and Brass Inc. has opened a district office for the central and southern Indiana territory at 1225 Circle Tower, Indianapolis. The new office, under the supervision of **P. H. Anderson,** district manager, who has been with the Dallas Division in Chicago and northern Illinois since 1922, will handle standard brass and copper mill products.

The Bristol Co., Waterbury 91, Conn., has announced the opening of a new branch office in Houston, Tex., with quarters in the Citizens State Bank Bldg. **Mr. D. D. Ault** will assume charge of the new office.

The Vinco Corp., Detroit, is moving its recently established Chicago district office to Tribune Tower, 435 North Michigan Ave. The office, in charge of **Fred G. Roberts,** resident engineer, serves the Illinois, Indiana, Wisconsin, Missouri and western Michigan territory.

Allen-Bradley Co., Milwaukee, manufacturers of electrical controlling apparatus, have moved both their New York and Cleveland offices. The New York office is now located at 155 East 44 St., New York 17, N. Y., and is still under the supervision of **C. N. Calkins,** New York district manager. The Cleveland office is at 4506 Prospect Road, Cleveland 3, Ohio, with **R. J. Roy,** Cleveland district manager, in charge.

The Wiremold Co., Hartford, Conn., announces that business in upper New York State formerly handled by **E. E. Card,** who is no longer with the company, will be taken over by **Messrs. J. E. Love and G. W. Sundstrom.**

Vickers Incorporated, Detroit, has established a West Coast test and service center in Beverly Hills to supplement the Los Angeles sales engineering organization.

OBITUARIES

George G. Raymond, vice president of the Todd Shipyards Corp., died at his home in Hoboken, N. J. Mr. Raymond was one of the original developers of the naval torpedo.

Floyd M. Wills, former manager of the Buffalo Steel Car Co., died at the age of 62. He was also, at one time, vice president and general manager of the Buffalo Copper & Brass Rolling Mill.

Michael J. Curtin, general superintendent and assistant works manager of the William Sellers Co., Philadelphia, passed away recently at his home. Mr. Curtin was associated with the company for 30 years, having started as a machinist in the firm.

Daniel R. Davies, former president of the Acme Machinery Co., Cleveland, died early this month. After joining the Acme Machinery Co., he rose through the ranks to become president in 1927 and retired four years ago.

Hallman Photo
Michael J. Curtin

Blank and Stoller
Daniel R. Davies

John Reece, inventor and retired president of the International Machine Company, died recently in Boston. He was known and cited, by Secretary of the Navy Daniels, for his invention which allowed submarines to emerge in five minutes instead of the former 15 minutes.

John Cameron, general manager since 1930 of Yarrows Ltd., Victoria, B. C., died recently after an extended illness. Mr. Cameron has been associated with the shipbuilding industry in England, United States and Canada.

Backrack 1921
Charles A. Clarke

Charles A. Clarke, founder of the Universal Boring Machine Co., died at his home in Watertown, Mass. on April 27, at the age of 90. He was associated with the firm of Hill, Clarke & Co., assuming the presidency of that company at the time of his father's death. In 1907 he started manufacturing the Universal Boring Machine and was president of that company until 1941 when he became vice president. At the time of his death, Mr. Clarke was a member of The American Society of Mechanical Engineers, having resigned from various other clubs and societies a few years ago.

E. D. Dickinson

E. D. Dickinson, designing engineer of the Turbine Engineering Division of General Electric's Lynn River Works until his retirement a year ago, died at the end of April. At the time of his retirement, Mr. Dickinson was the oldest turbine engineer in General Electric in both age and service. He had been employed by the company for 43 years in numerous capacities and in various offices.

James M. Gilmour, owner of the James Morrison Gilmour Gearworks of New York, died early this month at his home in Paterson, N. J.

MEETINGS

American Electroplaters Society. Annual meeting. Hotel Cleveland, Cleveland, Ohio. June 12-14.

American Institute of Electrical Engineers. Summer Technical Meeting. Jefferson Hotel, St. Louis, Mo. June 26-30.

American Iron & Steel Institute. Waldorf-Astoria Hotel, New York, N. Y. May 25.

American Machine Tool Distributors' Assn. War conference. French Lick Springs Hotel, French Lick, Ind. May 25-26.

American Management Assn. Annual meeting. Hotel Pennsylvania, New York, N. Y. June 8.

American Society for Testing Materials. Annual meeting. Waldorf-Astoria Hotel, New York, N. Y. June 26-30.

American Society of Mechanical Engineers. Semi-annual meeting. William Penn Hotel, Pittsburgh. June 19-22.

Silver Bay Association. Silver Bay Industrial Conference. Lake George, N. Y. July 26-29.

Society of Automotive Engineers National Transportation & Maintenance Meeting, The Bellevue-Stratford, Philadelphia, Pa. June 28-29.

Society of Automotive Engineers National War Materiel Meeting, Book-Cadillac Hotel, Detroit, Mich. June 5-7.

Shop Equipment News

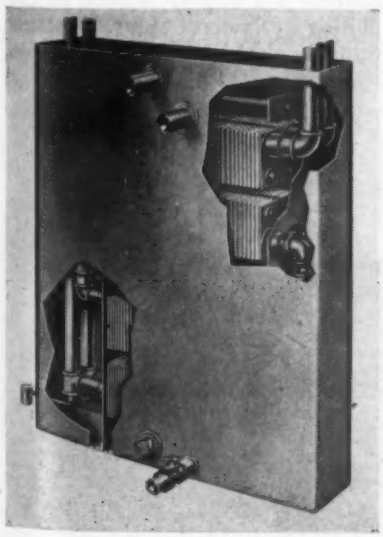
Bay State Lapping Points Made for Ex-Cell-O Machines

Bay State Abrasive Products Co., Westboro, Mass., has developed Blue Flash center lapping points for use on Ex-Cell-O center lapping machines. These points are made in all regularly required sizes and specifications, mounted on ½ in. mandrels. Different bonds and special treatments are available. The mandrels have heavier, deeper knurls to provide more binding surface for the cement.

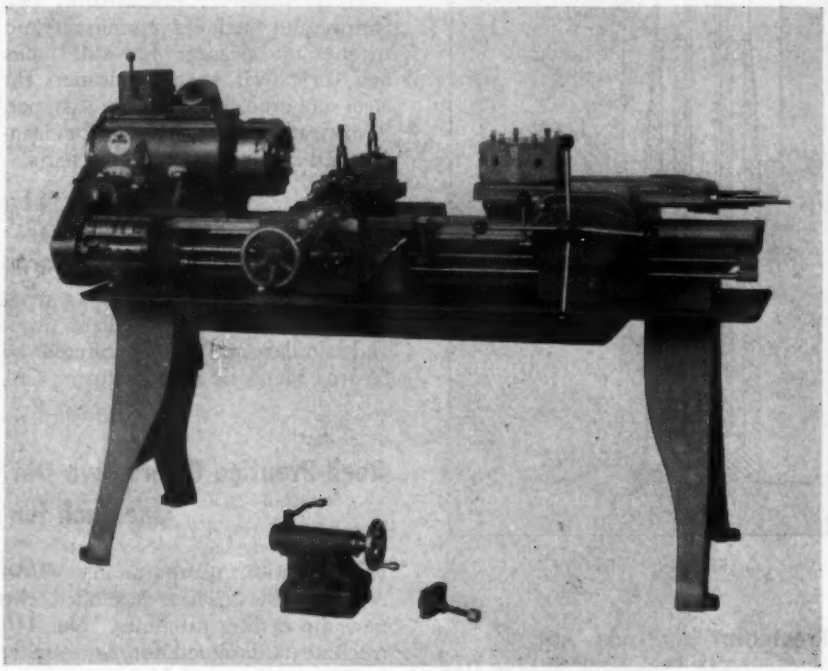
Murray Improved After Cooler Removes Air Line Condensation

D. J. Murray Manufacturing Co., Wausau, Wis., has produced an improved air cooling unit. This after cooler, used in removing condensation from the air line and reducing the temperature of the compressed air, occupies less space and can be readily furnished as a unitary structure with capacity to meet specific operating conditions.

It operates in conjunction with the discharge line of any air compressor, functioning automatically to cool the air and remove the condensation. The cooler may also be used as an interstage cooler for multiple stage compressor systems.



Murray air cooling unit



Le Blond Regal lathe with hexagon bed turret

Le Blond Regal Lathes in 13- and 15-in. Sizes Can Now Be Fitted With Hexagon Bed Turrets

A hexagon bed turret is now supplied on the 13- and 15-in. Regal lathes, manufactured by The R. K. Le Blond Machine Tool Co., Cincinnati 8, Ohio. This turret, which is 9 in. across faces, is a six-station head, supported on double preloaded adjustable precision roller bearings, rolling on a large bearing face. It is available with power feed or hand feed only.

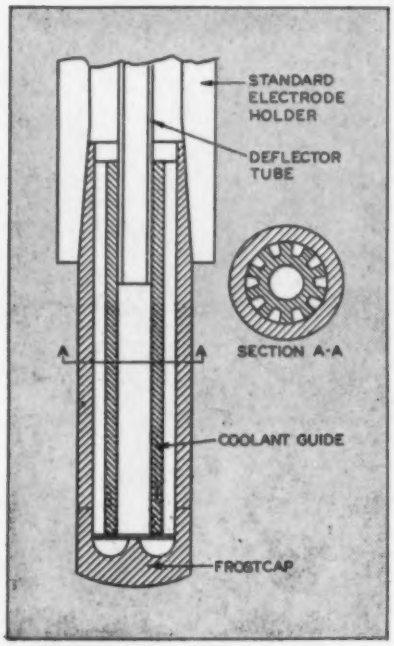
The turret block is automatically indexed to the next station when the ram is returned against the indexing trip by the pilot wheel, but it can be spun by hand to any face of the turret in either direction. Forward feeding motion of the ram is automatically disengaged when the stop screws move against the trip. Total length of travel of the ram with either hand or power feed, is 6¼ in.

Drive for the turret apron is taken from the feed rod, thus the full range of feeds (0.0025 to 0.144 in.) is available and selections made quickly through the quick change feed box. The apron is similar in design and has all the advantages of the regular carriage apron, including positive feed, automatic forced lubrication and a safety device on the feed rod that releases the feed when under-pressure is put on the tool or some obstruction gets in the way of the ram's forward movement.

The saddle casting takes the same bearings on the ways as the tailstock. The turret lock bolt has hardened and ground flat taper faces on both sides to hold the turret on center. When wear occurs, the bolt moves forward and seats solidly like a wedge, without lifting the turret. The ram can be clamped against backward movement when a center is placed in a turret hole and the lathe used for turning, instead of exchanging the turret for the tailstock.

When the turret is put on a lathe at the factory, the holes in the turret can be bored to customer's specifications up to 1 in. The turret will take No. 2 tools, projecting 9½ in. Dis-

tance from the end of the spindle nose to face of the turret, with the end of the saddle flush with the end of the bed on a 6-in. bed lathe, is 40 in. The turret weighs 250 lb.



Frostpoint electrode

Frostpoint Electrode Unit For Standard Holder Use

A self-adapting Frostpoint spot-welding electrode for use with standard electrode holders is offered by Frostrode Products, 19003 John R, Detroit 3, Mich. This Frostpoint unit is available in 5/8 and 7/8 in. outside diameter and any standard length.

When the self-adapting electrode is inserted in a holder, the deflector tube is engaged by a full-length coolant guide providing a metered flow of the coolant through the internally finned Frostcap. Return flow is through parallel passages.

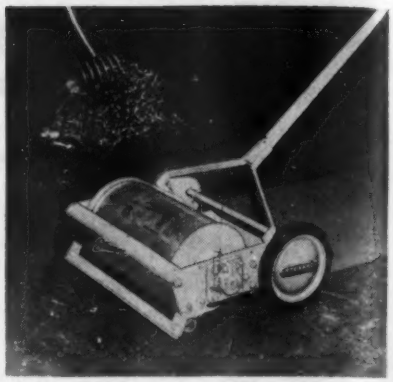
Hanson Van Winkle NL Cleaners Offered for Various Metals

A group of non-electric cleaners has been developed by Hanson-Van Winkle-Munning Co., Matawan, N. J. They are designated as NL cleaners and are designed for cleaning metals either by soaking or in washing machines.

Each cleaner is prepared in two forms, and includes aluminum and magnesium cleaners for still tanks and for power washers, cleaners for steel and iron, brass, tin and copper. Two cleaners are suited also for cleaning and brightening soldered parts.

Stearns Magnet Floor Sweeper Will Pick Up Light Scrap

A portable, light scrap-picking magnet sweeper for use on plant floors and similar surfaces is offered by Stearns Magnetic Manufacturing Co., Milwaukee 4, Wis. This unit consists of a drum, permanently magnetized to eliminate energizing cables. It is mounted on a chassis designed with anti-friction bearings.



Stearns magnet floor sweeper

The magnetic drum revolves with an 18 in. working face, making it practical for use around machinery.

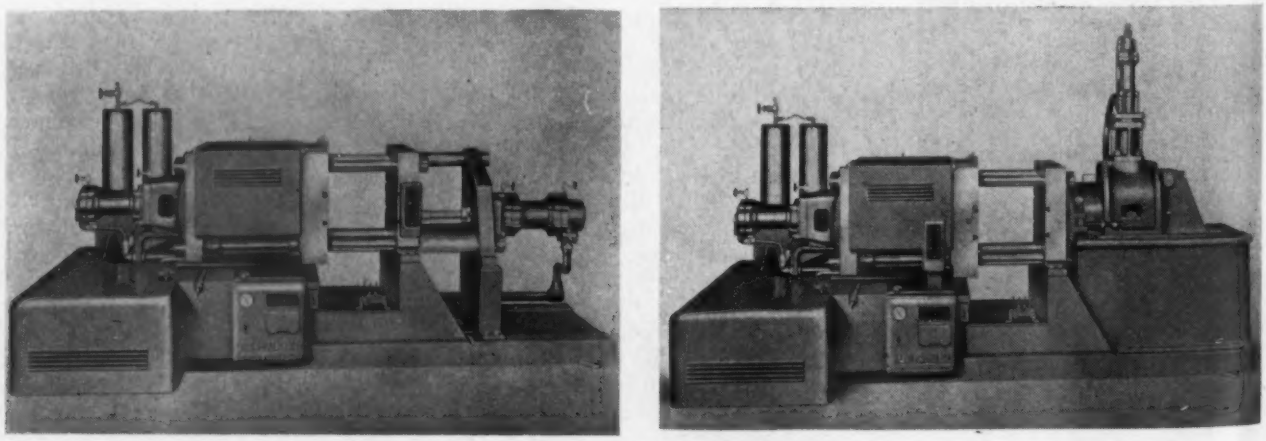
Reed-Prentice Offers Two Die Casting Machines, One Each for Aluminum and Zinc Type Materials

Reed-Prentice Corporation, Worcester 4, Mass., has developed two new die casting machines. No. 1½ machine is designed for zinc, tin or lead base alloys and No. 1½G is for aluminum, magnesium and brass alloys. The machines are so made that either machine can be changed, in a few minutes, to work on the other group of alloys.

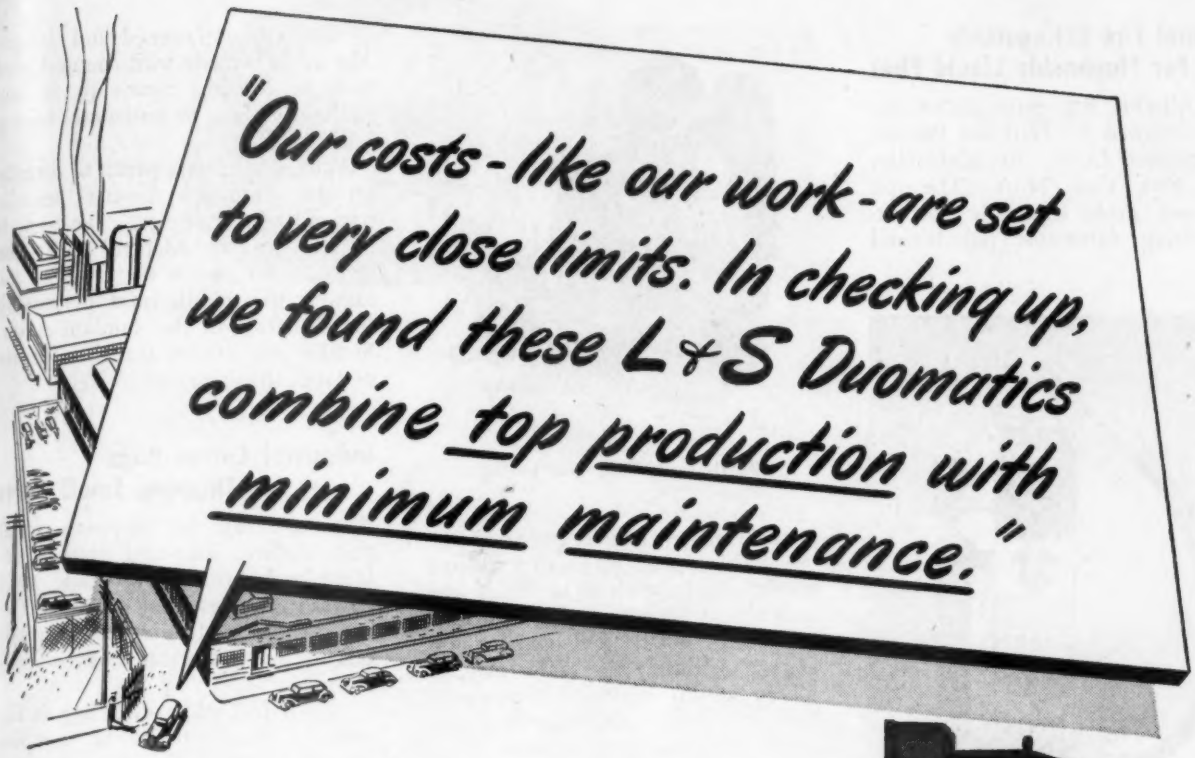
In the event that one machine is purchased to do both types of work, a separate cold chamber attachment or furnace attachment may be purchased as required, thus keeping machine investment to a minimum. Change from one type to the other may be made in four to five hours.

In general, construction features and operation sequences are similar for both machines. Features include: one-piece welded base and hydraulic tank; improved linkage with electric steel members, nitrided pins and hardened steel bushings; heavy steel castings for die plates, and improved hydraulic circuit to increase speed of cycle.

Other features are: electrically operated hydraulic control; both manual and semi-automatic control with electric interlock for operator's safety and to prevent shooting of metal until dies are securely closed; and arrangement for automatic ejection of castings and easy application of core pulling cylinders, for operation through electric pushbutton station.



Reed-Prentice die casting machines 1½G (left) and 1½

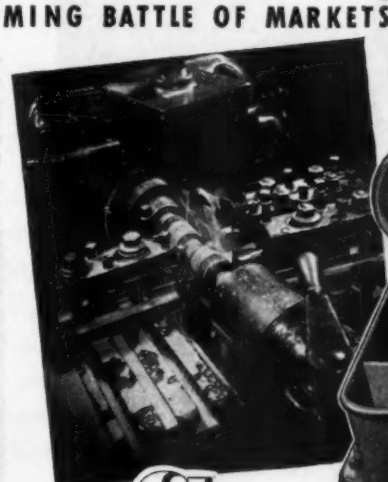

"Our costs - like our work - are set to very close limits. In checking up, we found these L & S Duomatics combine top production with minimum maintenance."

In thousands of war plants today, large numbers of unskilled and semi-skilled workers operate L & S Duomatic Lathes with amazing efficiency. Automatic controls, shifting responsibility from worker to machine, permit production in greater volume—with improved quality—at lower cost. Such performance a few years back could have been accomplished only by operators of the highest skill.

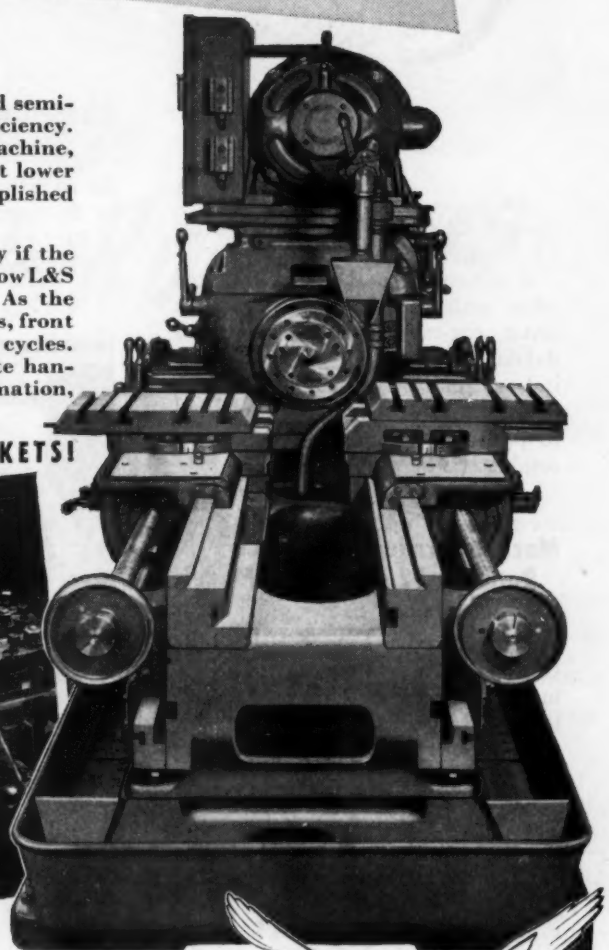
If your shop is equipped with old or worn lathes, and particularly if the manpower shortage requires hiring of unskilled personnel, learn how L&S Duomatics can help you maintain full production schedules. As the name implies, the 3-A Duomatic has dual carriages and cross-slides, front and rear, operating singly or together on the same or on different cycles. Automatic controls permit exact duplication of sizes and accurate handling of large or small quantities of work. For complete information, write for literature or call on Lodge and Shipley Engineers.

PREPARE FOR THE COMING BATTLE OF MARKETS!

● *Make your plans now for "the way back" to peacetime production. Aim to hit full stride with least delay. Thus, when purchasing a new lathe needed for wartime output, consider also how well adapted it is for future use. Here L & S "engineering foresight" can be of practical help by its proved capacity to build lathes adaptable for varied service through the years. This engineering foresight—result of 52 years specialized lathe experience—makes your wartime Duomatic equally efficient for peacetime use.*



▶ ENGINE
AUTOMATIC
TOOL ROOM
OIL COUNTRY
LATHES



THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI 25, OHIO, U. S. A.

L & S LATHES

National Fire Extinguisher For Flammable Liquid Fires

The All-Out fire extinguisher has been designed by National Powder Extinguisher Corp., 50 Rockefeller Plaza, New York, N. Y. The unit has been made especially for extinguishing flammable liquids and

National fire extinguisher

fires of electrical origin, and weighs 37 lb. fully charged.

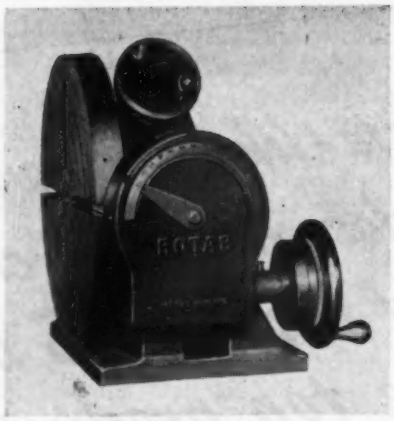
A stream of dry chemical is ejected when activated by heat, forming a dense, fire-smothering cloud over a flaming area up to 18 ft. The chemical, a non-conductor of electricity, is said to be harmless to people and to parts of motors or machinery, as residue is a harmless dust.

Machine Products Produces Rotab in 12 and 24 In. Models

A 12 in. and a 24 in. Rotab have been produced by Machine Products Corp., Detroit, Mich. The 12 in. model is adapted to milling operations and mounts easily on the table of a milling machine. It has a rotating table which can be turned to any degree and can be made to assume any position radially in addition to permitting its plane to be fixed to any angle from vertical to horizontal, even to position 30 deg. in the opposite direction without disturbing the initial clamping of the work. This model weighs 125 lb.

The 24 in. model can be adapted to a wide range of milling and boring operations. It weighs 688 lb.

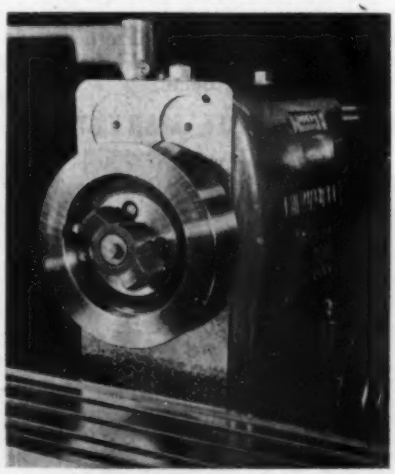
Both models have dials showing degree and minute graduations which register the angle of setting. An adjustable degree ring is provided under the faceplate to avoid excessive turning of handwheel to obtain the zero setting. A sine bar is furnished with the Rotab for accuracy on angular settings. The tables may be locked at any desired position—radial or angular—and may be disengaged to rotate freely by hand.



Rotab for milling and boring

Weddell Arbor or Adapter Provides Fly Cutter Adjunct

As an adjunct to the use of carbide or fly cutters, Weddell Tools, Inc., 1239 University Ave., Rochester 7, N. Y., has produced a flywheel arbor



Weddell arbor or adapter

or adapter. The arbor nose is made in any of the standard sizes, ¾ to 2½ in. diameter.

The shell end mill arbor is replaced by a flywheel arbor which mounts on the spindle of the machine. This combination arbor and flywheel has a nose which is a replica of the nose end of the shell end mill arbor, onto which the milling or fly cutter is fastened and driven. The arbor is made with counterbored back or locating means to fit any milling machine or horizontal boring mill.

For use of cutters which fit directly on the spindle, a flywheel spindle nose adapter is offered. The back is counterbored or adapted to fit the spindle nose, while the front is the same as the spindle nose, permitting the mounting of the standard cutter. Similar adapters are available for use of taper shank cutters.

Industrial Cotton Bags For Shipping Small Parts

A cotton bag for shipping small parts such as nuts and bolts is offered by Industrial Bag Corp., 1914 East 55 St., Cleveland 3, Ohio. The bag can be tied to the finished product and thus prevent loss of the small parts.

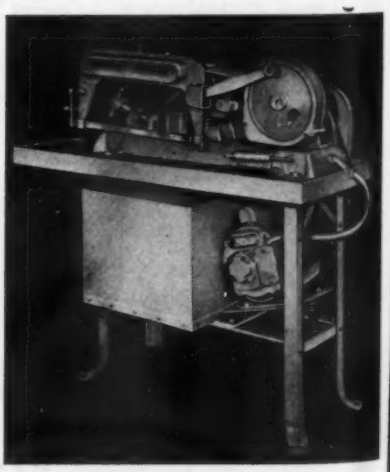
The Industrial mailing bag is for sending small parts or samples through the mail. Enevelope bags are used for mailing a first-class letter together with samples or parts.

Covel Offers Power Hacksaw For Hard or Soft Material

For small shop requirements and as an auxiliary unit, Covel Manufacturing Co., Benton Harbor, Mich., is offering the Excel power hacksaw in both floor and bench models. It is suited for either wet or dry sawing. The floor model occupies floor space 14¾×31 in.

Work up to 4 in. square stock can be handled, and the desired cut can be made at any angle up to 45 deg. A quick action vise holds the work in place.

Soft metals such as aluminum,



Covel power hacksaw

Ford-designed and Ford-built 500 horsepower V-8 tank engine weighing only 1500 lbs., employs Cone-Drive gearing to operate the intermediate drive shafts, between crankshaft and camshafts, saving both space and weight.

Tank space is hell on gears

Inside a tank, every cubic inch of space is precious. Tank engines must be as compact as possible, and here as in so many other military, naval and industrial applications, Cone-Drives do what would be virtually impossible with other forms of gearing.

Here you will find a single Cone-Drive gear on the crankshaft driving two Cone-Drive pinions on "vertical" shafts each of which in turn drives two camshafts. Each Cone-Drive pinion has to outlast and carry the load transmitted by *two* conventional worm gear sets, each larger than the Cone-Drive unit. Thus one Cone-Drive gear has to deliver the power transmitted by four conventional gears. In addition, the Cone-Drive used here also provides a step-up in ratio, simplifying and reducing the cost of the gears at the other end of the shaft.

That sort of performance is *inherent* in Cone-Drives —in which the gear envelops the pinion and the pinion envelops the gear, producing maximum area contact and maximum teeth in contact. Cone-Drives take only an average of ⅔ the room and weigh only around ⅓ as much as conventional right angle gearing of the same load capacity.

You'll find Cone-Drives in many everyday products when the war is over. In the meantime, if you don't know the "why and how" of Cone-Drives, we will be glad to tell you about them.

Ask for the following manuals:

CW-41B (for Executives) · CW-41A (for Design Engineers)

CONE-DRIVE DIVISION **MICHIGAN TOOL COMPANY**
7171 E. McNichols Rd., Detroit 12, U. S. A.

FOR VICTORY BUY UNITED STATES WAR BONDS AND STAMPS

bakelite, fiber can be cut at the rate of 80 strokes per min. on this hacksaw. Medium materials such as annealed tool steel alloy can be cut at the rate of 60 strokes per min., while hard materials such as spring steel can be cut at the rate of 40 strokes per min.

Ridge Makes Strap Wrench To Handle Pipe and Tubing

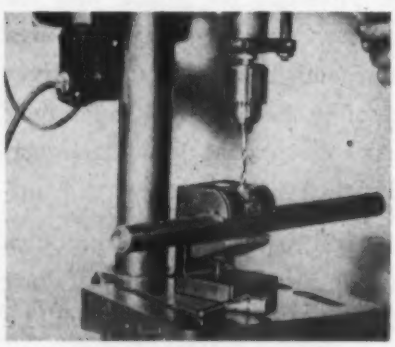
A Rigid strap wrench has been added to the line of equipment made by Ridge Tool Co., Elyria, Ohio. The wrench is made in two sizes: No. 2 with ⅛ to 2 in. capacity and 17 in. strap; and No. 5 with 1 to 5 in. capacity and 30 in. strap.

This tool is intended for handling polished nickel and chrome pipe and tubing. It has an I-beam handle and solid head, all in one piece, and has a hang-up hole in the end. The strap is removed for replacement by pushing out the pin held by spring clips.

Universal Work Holding Vise Handles Hex or Round Stock

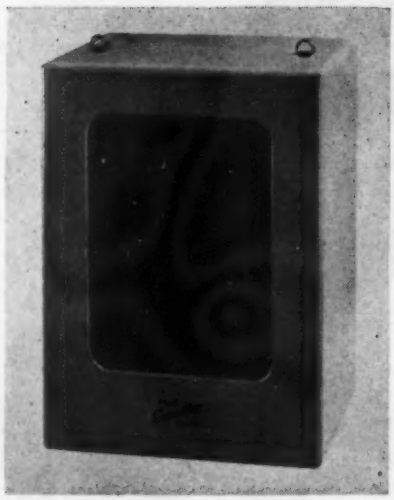
A center drill and mill vise is offered by Universal Engineering Co., 2230 National Ave., San Diego 2, Calif. Cross-center drilling in round stock can be performed with this tool. The drill bushings through which the drill passes are interchangeable, giving a wide range in hole sizes. Hex stock as well as round stock can be held in the vise as the V seat is 120 deg. angle.

Clamping action of the vise is the opposed jaw principle, leaving one



Universal work holding vise

surface of the work exposed for slot milling and so forth. All exterior surfaces of the vise are precision ground square and parallel, allowing its use in conjunction with any type of machine tool.



Executone baffle reproducer

Executone Baffle Reproducer For Use With Paging System

Model HI-8 duo-directional baffle reproducer is offered by Executone, Inc., 415 Lexington Ave., New York, N. Y., for use in conjunction with the company's music and voice paging systems. The unit is covered with battleship gray simulated leather, and measures 17×10½×23 in. high.

An 8 in. permanent magnetic speaker having a 6 ohm voice coil is inclosed in this baffle. An opening front and back provides duo-directional transmission. These openings have a protective covering of mesh which is faced with grill cloth to match the gray leather.

This unit is designed for use in any size area where up to medium noise conditions exist and wide angle distribution of voice and sound are desired.

An internal mounting for a special transformer matches the impedence of the reproducer unit to the wiring line and amplifier. Two suspension rings are fastened on top of the baffle for hanging.

Acromark Marking Machine Built for Power Operation

The No. 9AMP pedestal type power operated marking machine has been developed by Acromark Co., 9-13 Morrell St., Elizabeth, N. J. A wide range of accessories is available for use with this machine. Cradle rolls can be supplied to hold cylindrical pieces. Mandrels or stud mountings may be used to hold hollow cylindrical parts. Flat parts may be marked with a rotary type holder. This machine measures 36×24×46 in. high overall.

Acromark marking machine

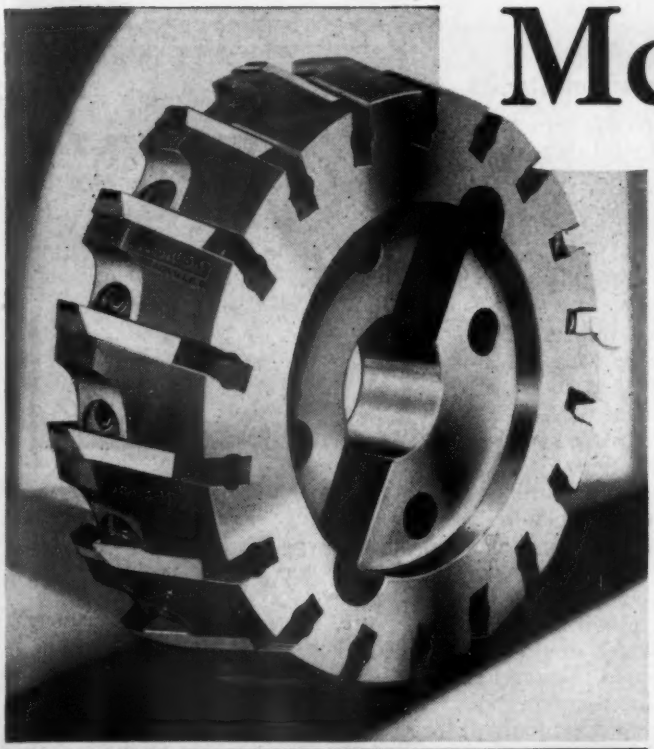
The part to be marked is placed on the cradle roll and the flat die or type is passed over it. For large parts a clutch lever is used to control the marking head for each stroke. Standard motors and roller bearing gear reduction units are used.

AO Ful-Vue safety goggles

AO Ful-Vue Safety Goggles Are Offered in Two Styles

Two styles of Ful-Vue acetate safety goggles are offered by American Optical Co., Southbridge, Mass. One of the goggles is available in a pink crystal color with white or Calobar six-curve armorplate lenses, while the other is fitted with side shields and comes in a pink crystal color with white lenses or in a green color.

These goggles are made of plastic and are said to be spark-proof. The bridge is made of heavy stock as well as the nose pads which have rounded edges and ample flare to withstand jolts and blows.



McCROSKY

Jack-Lock

SERRATED BLADE

MILLING CUTTERS

● **These days when milling machines are being used 'round - the - clock and milling cutter life is measured in hours, McCrosky's compact JACK-LOCK Wedge provides reserve locking power to insure rigidity which will surpass all the demands of increased speeds and feeds. . . . When the cutter has to be resharpened, Adjusting Screws behind the blades provide a quick, controlled means of holding to a uniform minimum the blade stock or carbide tip, to be ground away. You can measure this advantage in the longer blade life and the shorter down-time.**

Large stocks of JACK-LOCK Shell End Mills are maintained for immediate shipment. Standard Face Mills shipped three to five weeks from date of order, depending on size of Cutter and Quantity.

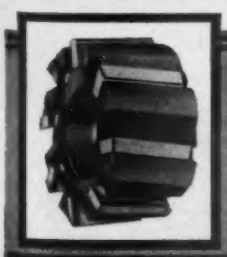
SPECIAL TOOLS

McCrosky Engineers have had long and varied experience in designing special purpose JACK-LOCK tools. All will improve performance and many will cut cost by combining operations. Your work prints will enable McCrosky Engineers to submit layouts of special purpose JACK-LOCK tools engineered to your jobs.

★

THE COMPLETE McCROSKY LINE

Super Adjustable Reamers, Adjustable Block Boring Bars, JACK-LOCK Milling Cutters, Special-Purpose Cutting Tools, WIZARD Quick-Change Chucks, Turret Tool Posts.



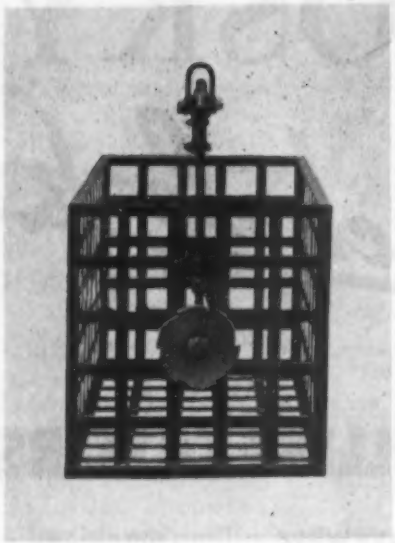
SERIES "S" JACK-LOCK SHELL END MILLS

JACK-LOCK HALF SIDE MILLS

JACK-LOCK STAGGERED TOOTH MILLS

EST. 1904
McCROSKY
TOOL CORPORATION
MEADVILLE, PA.

COST CUTTING TOOLS



Youngstown basket ratchet

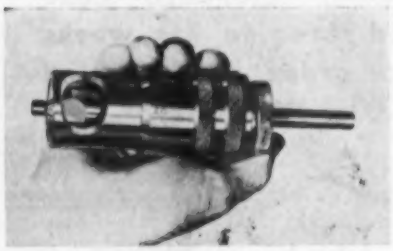
Youngstown Develops Ratchet For Holding Pickling Basket

Youngstown Welding & Engineering Co., Youngstown, Ohio, has developed a ratchet for holding its pickling basket in six different positions. It can be applied to most any size equipment. This feature provides an aid in draining the pickling acids from within the container.

Aero Countersink Tool Produced in Large Size

A large size micrometer stop countersink has been made by Aero Tool Co., Burbank, Calif. This tool countersinks up to 1¼ in. and is capable of countersinking ½ in. rivets.

This countersink can be locked at each micrometer setting in increments of 0.001. Adjustments are made manually, eliminating the need of an



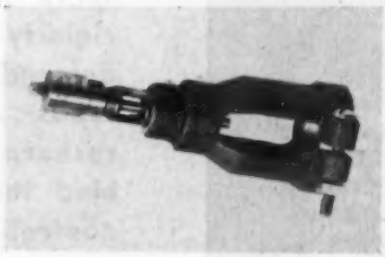
Aero large size countersink

adjusting tool and can be made while the tool is in operation. Standard countersink includes interchangeable 1 in. diameter cutter available in 72, 78, 82, 100, 110 and 115 deg. angles with or without integral pilot.

Du Mont Oscillograph Aids Transient or Recurrent Studies

Type 247 oscillograph has been made by Allen B. Du Mont Laboratories, Inc., 2 Main Ave., Passaic, N. J., to facilitate the investigation of transient as well as recurrent studies over a wide frequency range. Dimensions of this instrument are 14×26×19 in. high. It weighs 130 lb.

This oscillograph utilizes Type 5CP1 cathode ray tube with intensifier electrode, operated at an overall accelerating potential of 3,000 volts. High intensity patterns are obtained on the 5 in. diameter screen. The instrument is furnished with a medium-persistence green screen, but if a permanent record is required it may be supplied with short-persistence blue screen for high-speed photographic recording, or with a long-persistence green screen for visual observation of low-speed phenomena. The time base provides recurrent, single or repetitive sweep operation.



Topflight keyseating tool

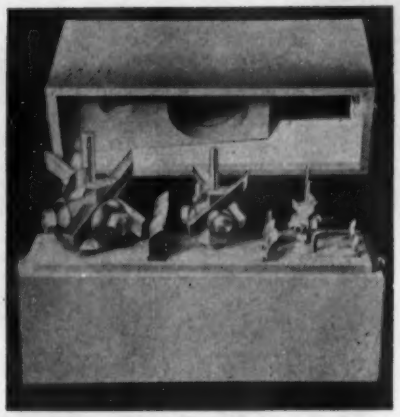
Topflight Keyseating Tool Simplifies Installing Rivnuts

Topflight Tool Co., Towson 4, Md., has designed a Rivnut keyseating tool to simplify installation of de-icer boot Rivnuts. It is said that this device replaces the broaching process, eliminating objectionable burrs.

The tool can be regulated to make seat of any desired depth to accommodate the Rivnut key. An automatic pilot provides accurate placement.

Sublan Anti-Corrosion Film Produced for Use on Steel

Sublan has been produced by Glyco Products Co., 26 Court St., Brooklyn 2, N. Y., to provide an anti-corrosion film for steel. The film also supresses latent finger prints on polished steel surfaces. Sublan is diluted with an equal amount of thin, acid-free mineral oil. Removal of the film from the surface is accomplished by cold solvent wash or dip.



Clark adjustable hole cutter

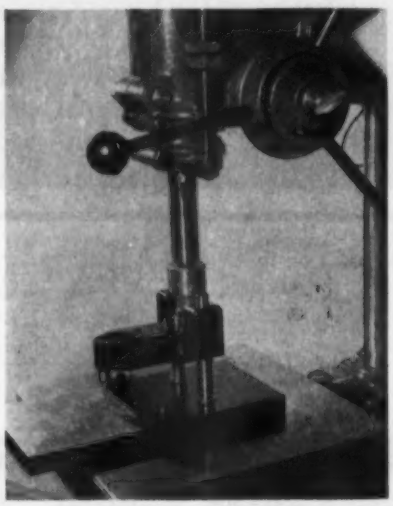
Clark Three-Blade Cutter Packed in Set of Three

A set of three adjustable hole cutters that cut diameters from ⅜ to 3½ in. has been produced by Robert H. Clark Co., 9330 Santa Monica Blvd., Beverly Hills, Calif. The cutters with an extra set of blades are packed in a wooden box 3½×7¼×10 in.

These cutters, with straight shanks for use as hand tools, in portable electric and pneumatic drills, or in light drill presses, are made to produce holes that require no after-grinding, reaming or filing. They may be used also in lathes and other spindle type machines.

Edlund Back Spot-Facing Tool For Inaccessible Hole Use

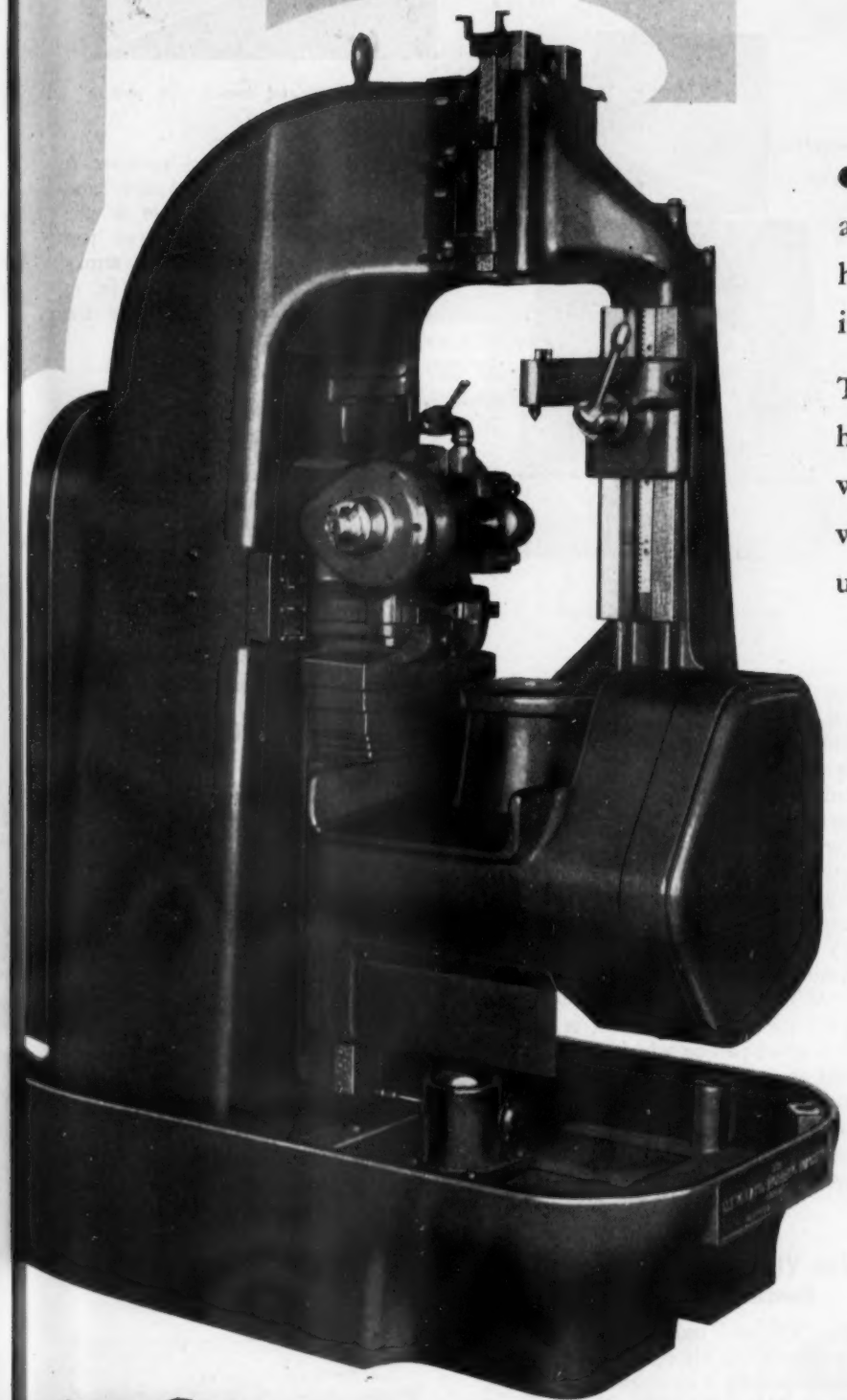
A back spot-facing device for operations on parts where holes to be spot-faced or countersunk are inaccessible is manufactured by Edlund Tools, Inc., 4473 Woodward Ave., Detroit, Mich. The tool is mounted in any standard drill press by means



Edlund back spot-facer

THE RIGIDHOBBER

HOBS GEARS AND SPLINES ACCURATELY



● The Rigidhobber is designed and built to generate precision hobbed gears and splines either in quantity or small lots.

The rigid support to the work-head both above and below the work eliminates spring in either work or hob and assures the utmost in precision.

For accurate work—high production—low cost generation of splines and hobbed gears consult Cleveland Hobbing Engineers.

This bulletin tells all about Rigidhobbers—what they are—how made—and how they help to reduce your costs.

The CLEVELAND HOBBING MACHINE Company

General Offices:
1311 CHARDON ROAD
CLEVELAND 17, OHIO

Chicago Office:
624 S. MICHIGAN AVE.
CHICAGO 5, ILLINOIS

BUILDERS OF RIGIDHOBBERS AND RIGIDTURNERS

of a Morse taper shank. Designs have been projected to take care of cutters up to 3 in. in diameter, but larger sizes can be provided.

This device consists essentially of a body casting into which is built spur gear trains which transmit the rotational movement of the drill press spindle to the spindle in the nose end of the casting to which the cutter is attached. The cutter spindle is mounted in a combination of ball bearings and needle bearings. The gear trains are kept at different levels, separated one from the other. This feature is said to prevent the stripping of the teeth in all gears in case a tooth is broken.

Francis Hydraulic Press For Plastic, Wood, Rubber

A general purpose hydraulic press for plastics, rubber, compreg wood and other production work has been produced by Charles E. Francis Co., Rushville, Ind. The press is available in four platen sizes: 12×12, 18×18, 24×24 and 30×30 in., with

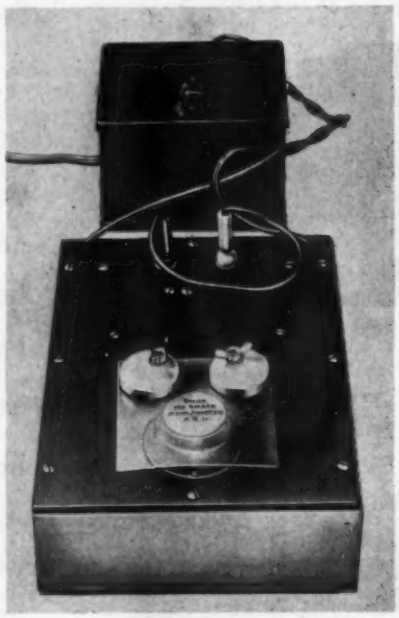
Francis hydraulic press

or without hot plates. Special sizes can be built to suit individual requirements. They can be furnished with or without two or more electrically or steam heated hot plates, and with hand pump (single or double), motorized or pneumatic pumping unit, automatic pressure controls.

The press provides a maximum gage pressure of 2,000 lb. per sq. in., and pressures of each size are 50, 113, 133 and 153 tons respectively. Any number of hot plates can be supplied.

Acme Met-L-Etch Marking Units Made for Flat and Round Parts

Two models of Met-L-Etch for marking metal by the electrolytic method are offered by Acme Metal Marking Equipment Co., 2222 West Fort St., Detroit 16, Mich. One model is used



Acme Met-L-Etch marker

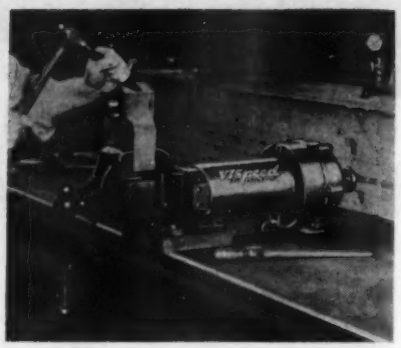
for marking flat surfaces, the other for marking the periphery of round parts. Names, numbers, trade marks, inspection symbols and other data can be permanently etched on smooth metal surfaces without the use of acid. Part to be marked does not require any special preparation, nor is cleaning or neutralizing required after being marked. This unit measures 2×6×9 in. and has a 110 volt a.c. transformer.

A drop of conductive solution, good for 500 impressions, is applied to a silver pad on which rests a celluloid stencil engraved with the mark to be etched. The part is placed on the stencil in contact with adjustable guide posts. Current is turned on by a slight pressure.

Van VISpeed Unit Converts Bench Vise to Air Operation

The VISpeed unit for converting a bench vise to air operation has been developed by Van Products Co., Erie Trust Bldg., Erie, Pa. This cylinder unit is attached to the vise body and screw of any 4 or 4½ in. vise.

Toe pressure on the pedal closes



Van VISpeed bench vise unit

the vise jaw while heel pressure is applied to open them. Pressure from 0 to 2½ tons is available at the vise jaws. After the required jaw opening is selected the piston stroke can be adjusted from 0 to 1 in. to speed opening and closing of the vise.

Carlin Adds Four Grades Of Electrodes to Its Line

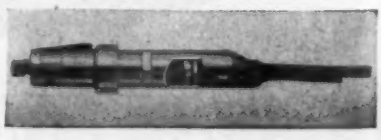
Four additional grades have been added to the line of Perfection welding electrodes made by Anthony Carlin Co., 2717 East 75 St., Cleveland, Ohio. Grade P-61 is a shielded arc, general purpose, straight polarity direct current electrode for welding mild steel in all positions. It meets the requirements of A.W.S. Classification E6012.

P-103 is a shielded arc alternating current electrode suitable for all position welding. It meets requirements of A.W.S. Classification E6011. This electrode can be used also for welding the low alloy high strength steels when they are used primarily for their high strength properties.

P-170 and P-180 are bare and wash coated electrodes which meet the requirements of A.W.S. Classifications E4510 and E4511 respectively.

Keller Pneumatic Filing Tool Can Be Used As a Power Saw

For fine finish filing in shops making die-casting dies, plastic molds and airplane parts, Keller Tool Co., Grand Haven, Mich., has produced a pneumatic filing tool designated as



Keller filing tool

HELPING DESIGNERS TO SEE AROUND CORNERS

NEW SF-10R

OVERSIZE ROTATING BEAM FATIGUE MACHINE

BALDWIN SERVES THE NATION...
WHICH THE RAILROADS HELPED TO BUILD

Published reports of studies indicate that specimens of 1" minimum diameter eliminates "Size-Effect" in fatigue.

SPECIFICATIONS: Model SF-10 R Rotating Beam Fatigue Testing Machine Capacity: 0-10,000* inch-pounds by units of 5-inch-pounds (Bending Moment). Specimen size: Diameter—1 inch at 100,000 p.s.i. (larger diameters of lower stresses). Length—adjustable from 3½ inches to 9½ inches. Motor drive—1½ H.P., 220 volt, 3 phase, 60 cycle, 3600** R.P.M. Length—6'-3". Width—1'-10". Height—4'-0". Net weight—1500 pounds. *Shipping* weight—1900 pounds. *1000 inch-pounds on beam. Additional capacities by four 2000 and one 1000 inch-pounds weights hung on beam end. **Slower speed or multiple speed motors as ordered.

The Baldwin Locomotive Works, Baldwin Southwark Division, Philadelphia, Penna., U.S.A. Offices: Philadelphia, New York, Chicago, Washington, Boston, Cleveland, St. Louis, San Francisco, Houston.

BALDWIN
PRODUCTS

Hydraulic presses, Testing equipment, Steel forgings and castings, Diesel-electric locomotives, Diesel engines, Metal plate fabrication, Rolled steel rings, Bronze castings, Heavy machine work, Crane wheels, Bending rolls, Plate planers, Babbitt metal, Alloy iron castings, Briquetting presses.

BLW THE BALDWIN GROUP **BALDWIN**

SOUTHWARK
TESTING EQUIPMENT

Model 1416. It can be used also as a portable power saw for making irregular saw cuts by substituting a hacksaw blade for the file.

This unit includes the 000 Keller rotary air motor together with a cam and piston with ball bearing assembly to transfer the rotary motion of the motor to the reciprocating motion of the file.

The tool is made in one size with a free speed rating of 1,500 strokes per min. and with a fixed length of file stroke of 7/16 in.

Detroit multiple thread tap

Detroit Multiple Thread Tap For Threading Plane Fittings

An Acme multiple thread tap for threading of quick removable type fittings as used in aircraft assemblies has been designed by Detroit Tap & Tool Co., 8432 Butler St., Retroit 11, Mich. The tap is being produced in range from 3/8 to 1 in. diameter, both 12 and 10 pitch, while available types range from double to sextuple thread taps.

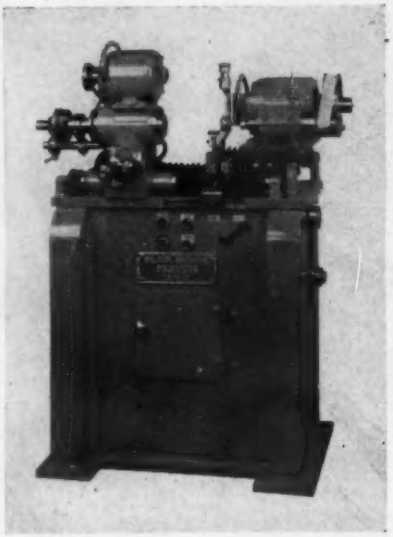
Traversite Reclaiming Agent For Spray Painting Booth

Traversite reclaiming agent for waterfall type spray painting booths has been produced by Penetone Co., Tenafly, N. J. The material is packed in 300-lb. fiber drums, and comes in a concentrated powder form.

When introduced into the circulating water at the rear of the booth, it is said to prevent the overspray from fouling the flood sheets, nozzles and circulating system, and also prevents the metal back-set from corrosion and rust.

Wilson Maxi-Grinder Provides Six Grinding Spindle Speeds

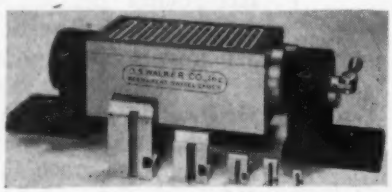
All moving parts vulnerable to abrasive, dust and particles are totally sealed on the Maxi-Grinder being manufactured by Wilson Machine Products, 1231 Beaufait Ave., Detroit 7, Mich. This internal grinder has a universal work spindle head and collet capacity of 1 5/8 in. The machine is so arranged that loading work head, power rapid traverse to work position and feed are all performed with one continuous motion of the operator's left hand.



Wilson Maxi-Grinder

Power traverse of the grinding spindle can be quickly adjusted to required length of stroke, which is positive, making it possible to grind shoulder or blind holes. All grinding dust generated while the wheel is working is drawn through the draw bar into a dust collecting system, eliminating all metal and abrasive particles which might load the grinding wheel.

Power traverse of grinding spindle is 2 1/2 in.; length of traverse of work head is 8 1/2 in., and the work head swivels 95 deg. The machine is 24 in. deep, 36 in. wide and 42 in. high.



Walker permanent magnetic chuck

Walker Makes Permanent Magnetic Swivel Chucks

O. S. Walker Company, Worcester, Mass., is producing a permanent magnetic swivel chuck in three sizes. The chucks have graduated dials enabling them to be set at any angle up to 180 deg. Built to retain magnetic holding power indefinitely, pole divisions of the chucks are only 3/8 in. apart. Pole divisions may be furnished in several different divisions to suit work requirements. Sizes available are 4×8, 6×18 and 18×24 in.

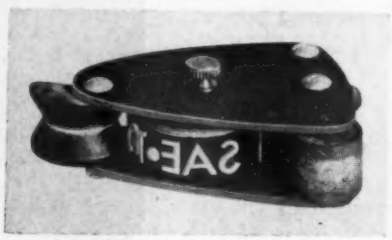
So-Lo Dura-Val Floor Runner Has Ribbed Non-Skid Surface

So-Lo Works, Loveland, Ohio, has produced a composition floor runner which is said to have the appearance of rubber. Dura-Val floor runner has a ribbed, non-skid surface, is waterproof and washable. It is made in rolls 30 ft. long by 36 in. wide.

Topflight Marking Device For Metal, Tube, Flat Pieces

The Silver Streak metal marker is available from Topflight Tool Co., Towson 4, Md. This marking device will print firm name or any other identification on metal, tube, bar or flat pieces.

The set includes printer, type, ink and necessary accessories. Any combination of letters or numerals in any color are available. A silver ink provides contrast on dark metals. Other color inks are also available. It is said that the imprint dries immediately.

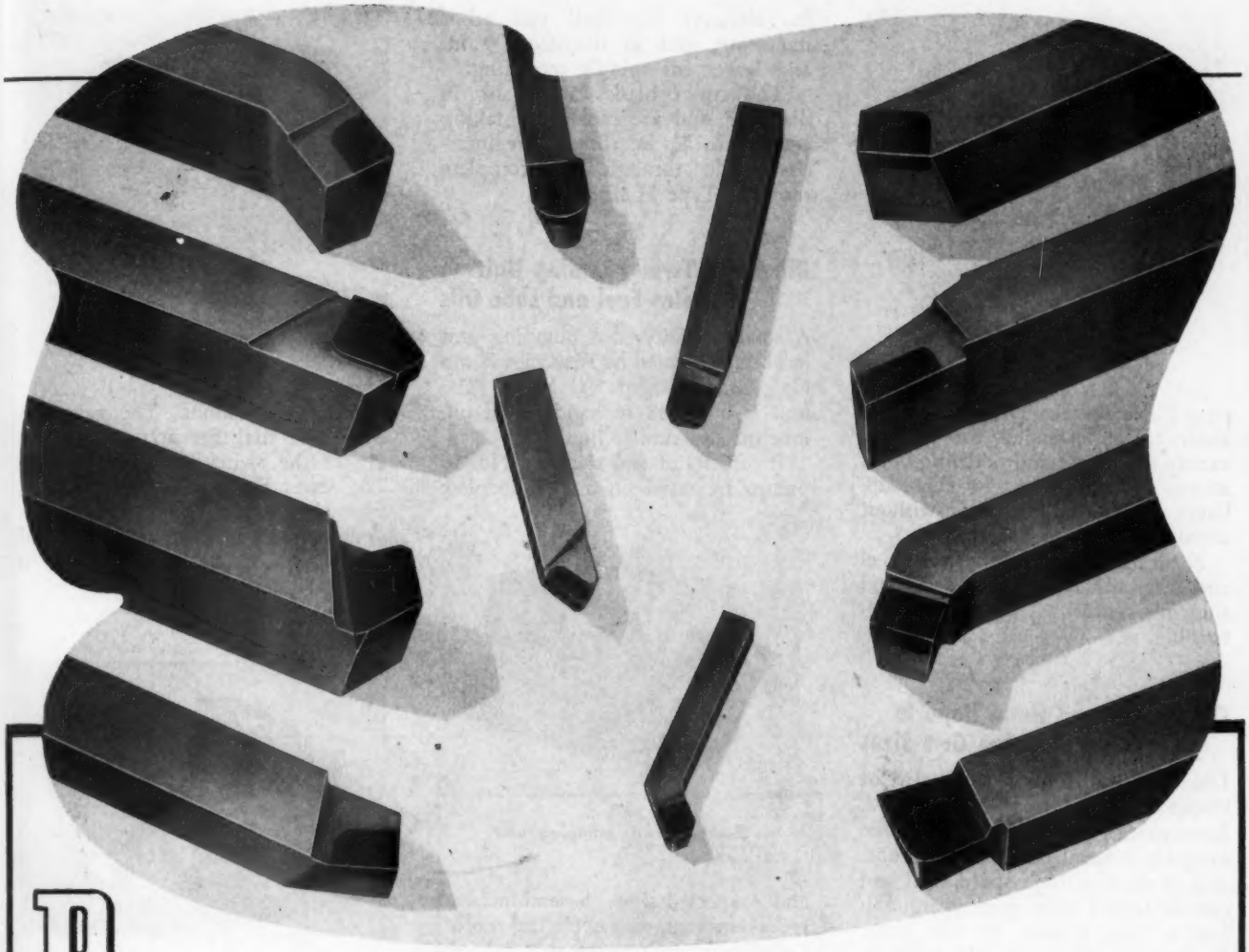


Topflight metal marker

Di-Arco Shear No. 3 Permits Accurate Slitting, Notching

O'Neil-Irwin Manufacturing Co., Minneapolis 15, Minn., has developed the DI-Acro shear No. 3 which incorporates in its design many changes suggested by actual field usage of other shears manufactured by the company. The shear has a full width shearing capacity of 18 gage steel plate in widths up to 12 in. Net weight is approximately 150 lb.

Among the features of this new shear, which is guaranteed to work to tolerances of 0.001 in. is a precision adjustment for accurately stop-



Prompt, Economical Service On All Types Of "MADE TO ORDER" Single Point Carboloy Tools

Complete facilities are available at Carboloy to fill your exact requirements for all types of "made-to-order" single point Carboloy tools. Designed for maximum tool economy and operating efficiency, "made-to-order" Carboloy tools are supplied finished ground ready for the job, or "milled and brazed" (you grind).

Most users specify low cost *STANDARD* Carboloy Tools for 60% to 80% of their machining applications—and use "made-to-order" tools principally where large quantities of special styles are required or where shapes cannot be adapted from "standards" by rapid grinding.

Whether your carbide requirements cover "standards" or "made-to-order",—or *both*, specify "Carboloy" for prompt, economical service.

CARBOLOY COMPANY, INC.
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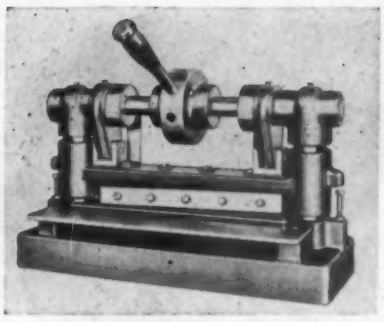
For Cutting CAST IRON and Non-Ferrous Metals

For Cutting STEEL

TUNGSTEN CARBIDES ★★★ TUNGSTEN CARBIDES WITH TANTALUM AND/OR TITANIUM CARBIDES



DI-Acro Shear No. 3

ping blade travel. This permits the shear to be arranged for a large variety of slitting and notching operations. A built-in gravity chute delivers all sheared materials without attention from the operator.

Shear blades are of heavy tool steel and are adjustable for wear and shearing control. They are also reversible.

Oscap Diamond Hand Hone Is Available in Three Grit Sizes

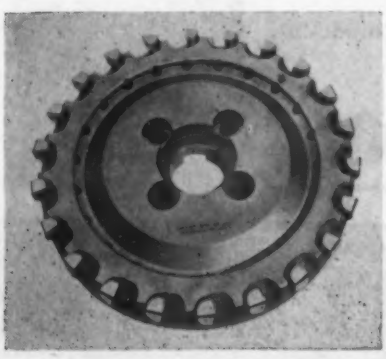
Diamond Tool Replacements, div. of Oscap Manufacturing Co., 207 W. Saratoga St., Baltimore 1, Md., has available a metal bonded hand hone, said to sharpen high speed steel and carbide tipped tools quickly, through just a few strokes of the hone. Makers say the hone will hold its flat surface without scoring, grooving or chipping.

The Oscap diamond hone is made in three grit sizes: coarse, 100 grit; medium, 220, grit; and fine, 320 grit. Hones are 4 in. long.

Lovejoy Milling Cutter for Arbor and Spindle Mounting

Type H heavy-duty face milling cutter has been produced by Lovejoy Tool Co., Springfield, Vt. This cutter is furnished in diameters 6 to 8 in. inclusive for shell end arbor mounting, and in diameters 9 in. and larger for spindle mounting.

The cutter blades are 1 in. in diameter, and are capable of taking cuts up to ¾ in. Blades are interchangeable through the complete range of Type H sizes.

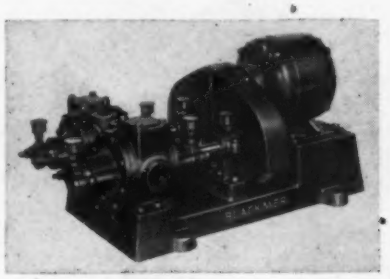


Lovejoy milling cutter

Blackmer Twin Pumping Unit Handles Fuel and Lube Oils

A small capacity twin pumping unit has been designed by Blackmer Pump Co., Grand Rapids 9, Mich. The unit is designed to handle fuel oil, lube oil and similar liquids.

It consists of two standard No. 50 pumps mounted on a cast bedplate and connected through semi-inclosed reduction gears to an electric motor. Capacity of each pump is 3 gal. per min. at a discharge pressure of 100 lb. per sq. in. Pump speed is 570 r.p.m. Similar twin units are now available with clutches to permit alternate or simultaneous pumping.

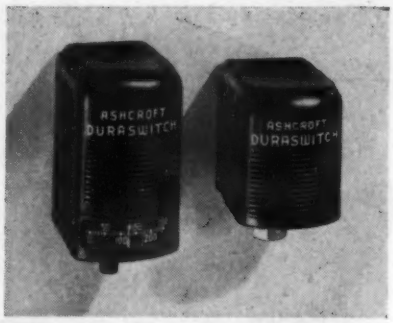


Blackmer twin pumping unit

Ashcroft Series E-200

Ashcroft Duraswitch Available For Use With Company's Gages

The Ashcroft Duraswitch, designed for use with the Ashcroft gage, is offered by Manning, Maxwell & Moore, Inc., Bridgeport 2, Conn., in two series. Series E-100 is for pressure applications only, while Series E-200 is for both pressure and temperature applications. The gage has slide rule dial for accurate adjusting of the switch to control point. The series E-200 may be used as a pressure control and pressure gage combination, or temperature control and thermometer combination, in single or duplex types.



Ashcroft Series E-100

Dearborn toolmakers' gage set

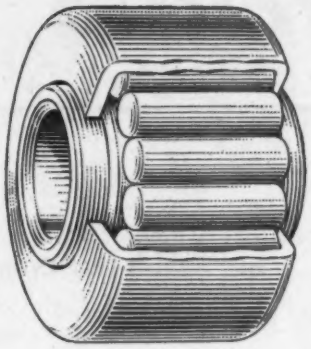
Dearborn Gage Provides Set Of Personalized Gage Blocks

For toolmakers who desire a personalized set of chromium plated gage blocks, Dearborn Gage Company, 22038 Beech Street, Dearborn, Mich., has provided a set consisting of six blocks. Sizes included are 0.0625, 0.125, 0.250, 0.375, 0.500 and 1.0 in., all contained in a hand rubbed walnut case.

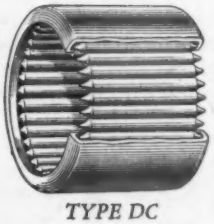
Sterling Easymount and Wheel Made to Fit Various Grinders

Easymounts and wheels in sizes to fit various types of grinders have been produced by Sterling Grinding Wheel Div., Cleveland Quarries Co., Tiffin, Ohio. They are suited for Sellers, Heald, Ex-Cell-O, Baldor, Hammond, Delta, Prosser, Critteron and Bura-way grinders, and are supplied in coarse grain for roughing, medium for semi-finishing, and fine for finishing. Worn wheels can be replaced.

Here's Another New Needle Bearing in The Torrington Line

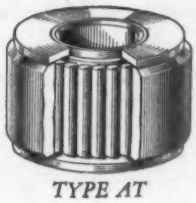


TYPE PN



TYPE DC

TYPE FDT



TYPE AT

TYPE NCS

TYPE RC

THE PN TYPE NEEDLE BEARING, DESIGNED PRIMARILY FOR AIRCRAFT PULLEYS, OFFERS INTERESTING ADVANTAGES IN OTHER THAN PULLEY APPLICATIONS

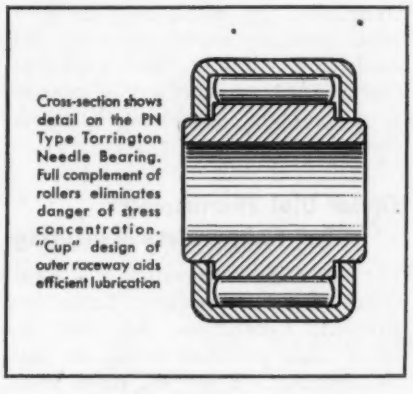
The most recent addition to the types of Torrington Needle Bearings currently available is the PN Needle Bearing designed for aircraft pulley applications.

Utilizing the Needle Bearing principle of a full complement of small diameter needle rollers, this new addition to the Torrington line offers the same basic advantages as the other types: high radial load capacity, light weight, compact size, efficient lubrication, ease of installation, and, of course, gives the desired ease and "feel" of anti-friction operation.

Standard (Army and Navy Specification AN-FF-P-796) Aircraft Pulleys equipped with the PN Type Torrington Needle Bearing are currently available. They offer plane builders another opportunity to utilize the same advantages which have made Torrington Needle Bearings so widely used by the industry, particularly in aircraft control applications.

Other Applications Foreseen

The sturdy construction and simplicity of the design of the PN Type Needle Bearing, as illustrated in the accompanying x-section, suggests that it will find many uses in applications other than aircraft pulleys where a compact, high capacity, low cost anti-friction unit can be employed. It is installed by a simple press-fit into the outer "housing" and the bore of the inner race fits directly over the shaft or axis.



Cross-section shows detail on the PN Type Torrington Needle Bearing. Full complement of rollers eliminates danger of stress concentration. "Cup" design of outer raceway aids efficient lubrication

If you are interested in either Needle Bearing equipped aircraft pulleys or in the application of the new PN Type Needle Bearing for other uses, our engineering department will gladly provide more information. Further data on the features and advantages of this and other types of Torrington Needle Bearings will be found in our Catalog No. 105 available on request. Write for your copy today.

• • •

THE TORRINGTON COMPANY

Established 1866 • Torrington, Conn. • South Bend 21, Ind.

"Makers of Needle Bearings and Needle Bearing Rollers"

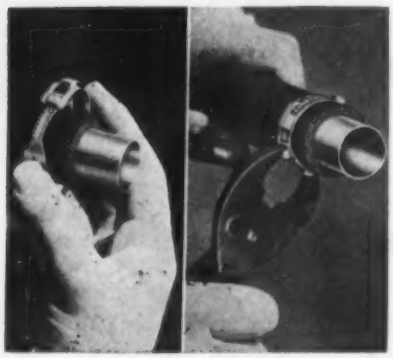
New York Boston Philadelphia
Detroit Cleveland Seattle
San Francisco Chicago Los Angeles
Toronto London, England

LET'S GO, U.S.A. KEEP 'EM FLYING

TORRINGTON

NEEDLE BEARINGS

Parts and Materials



Tinnerman hose clamp

Tinnerman Produces Hose Clamp With One-Piece Construction

A one-piece hose clamp which may be snapped over the hose into prelatched position by hand has been developed by Tinnerman Products, Inc., 2113 Fulton Road, Cleveland 13, Ohio. It is available for all sizes of AN and Ordnance specification hose in a wide range from ½ in. outside diameter and up.

The clamp is made of SAE 1060 spring steel with parkerize and zinc chromate primer finish. Final lock is made with hand pressure on pliers. The unit is made for low pressure connections and is said to exert an even pressure around the circumference of the hose.

U. S. Stoneware's Duralon Has Widespread Application

Duralon, a new basic resin, is announced by U. S. Stoneware Company, Akron, Ohio, as being available for limited commercial and experimental use. It is said to have the lowest water absorption of an organic resin, be insoluble in any solvent or combination of solvents (after activation), to have high electrical resistivity, stability in storage and be easy to work.

In its pure form it is a heavy, viscous liquid. Use of catalysts and mild heat causes Duralon to become an extremely hard, dense, black substance. While it can be molded, its chief use now is as an impregnant, bonding or laminating agent or as a protective coating. As heat is applied, Duralon coatings remain thermoplastic up to a point, at which time they become increasingly thermosetting. Other types are in stages of development.

du Pont Produces Improved Aluminum Explosive Rivet

An improved explosive rivet that fits itself to the hole has been developed by E. I. du Pont de Nemours & Co., Wilmington 98, Del. This unit is available in diameters of 5/32 and 3/16 in. in modified brazier types.

The rivet is expanded from within along substantially its entire shank by a tiny explosive charge. Improvement of this aluminum alloy rivet was accomplished by embodying in it a small auxiliary explosive cavity and modifying slightly the explosive charge. The auxiliary cavity extends from the main chamber in the shank toward the head of the rivet.

Taylor Dial Thermometer For Temperature Measuring

For measuring temperature at a point remote from the medium, Taylor Instrument Companies, Rochester 1, N. Y., has produced a 4½ in. dial thermometer. This 53K series mercury actuated instrument is available in several ranges from —40 to 900 F.

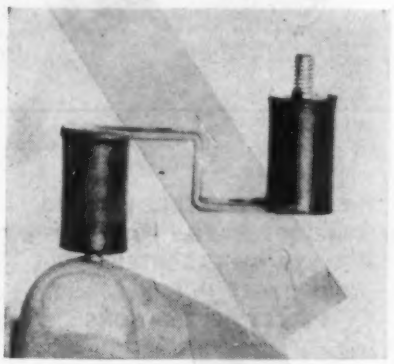
The unit has a plastic case which is said to be resistant to corrosion and shock. The metal dial is finished in black with white figures.

Taylor dial thermometer

Goodrich Resilient Mounting Has Rubber-Like Cylinders

Resilient mounting with cylinders of rubber or rubber-like materials interconnected by arms in S-fashion has been developed by B. F. Goodrich Co., Akron, Ohio. The arrangement permits soft suspension under light load and freedom of movement in all directions.

This mounting handles shear, bending, torsional or twisting stresses. It can be stressed also simultaneously under both shear and tension. Various arrangements of the rubber cylinders and arms change the rate of deflection in any direction.

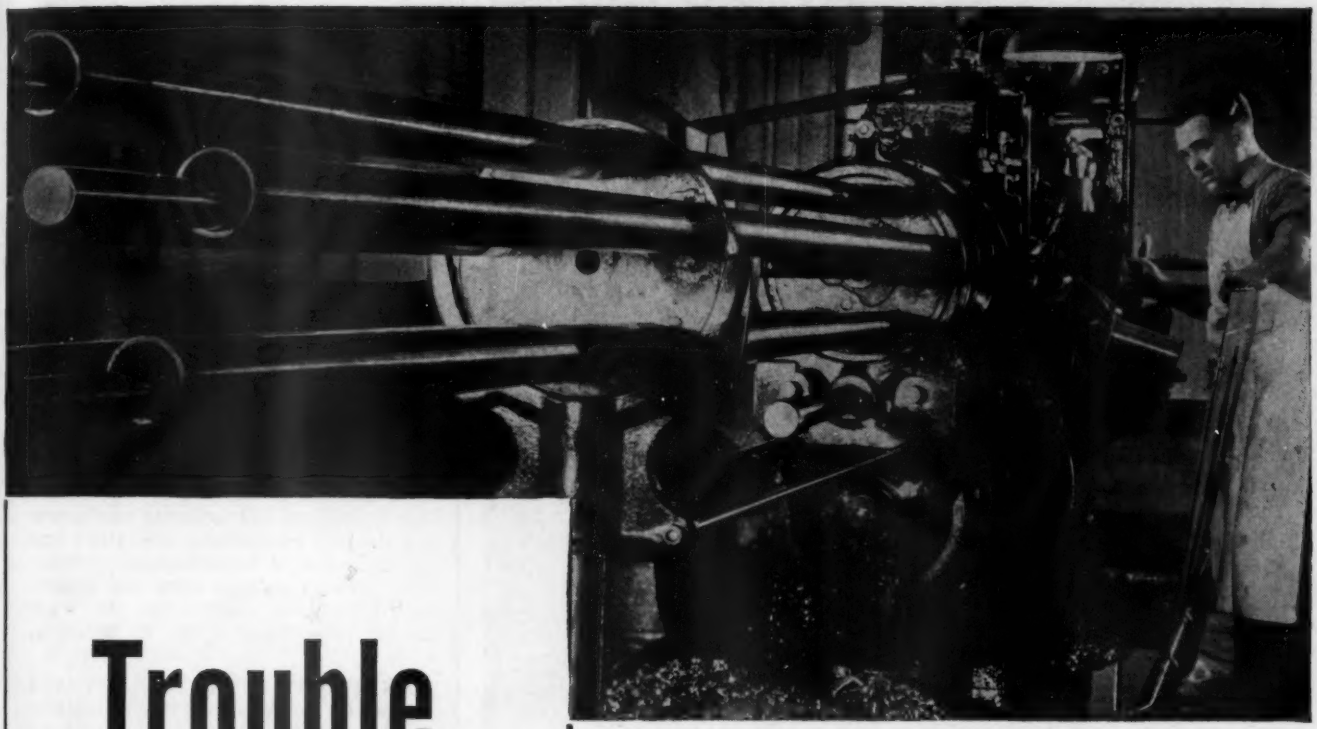


Goodrich resilient mounting

Taylor Now Has Available Process Timing Mechanism

Taylor Instrument Companies, Rochester 1, N. Y., now has available process timing mechanism for Fulscope temperature or pressure controllers. This device is built into either the single-duty Fulscope recording temperature or pressure controller.

The instrument is started manually by adjusting to the desired time period. Timing begins when the apparatus reaches the desired control point. At the end of the timed period the process timing mechanism automatically ends the process. Several variations of the instrument are available.



No trouble here: Revere Free Cutting Brass Rods, 1-5/16 inch diameter, 120 inches long, are fed into this five-turret lathe, which counterbores, spots, drills, reams, forms, and cuts off an endless stream of finished caps for the rotor units of electric clocks. This brass is ideal for high-speed automatic machining.

Trouble Tickles Revere

EVERY once in a while somebody has difficulty with materials. That's true of every industry, every product.

Revere knows the non-ferrous metals, because it has been working with them since 1801 and cooperates closely with customers in ironing out troubles. It's a give-and-take process, this method employed by Revere. Time after time, we have been asked: "What alloy should be used for such and such a part? It has to be just so hard, resist the corrosion of this and that, and the weight, size and cost restrictions are thus and so." And again: "The metal we are using isn't performing as we expected. Is there something wrong with our fabrication, or should we change our specifications?"

Revere doesn't pretend to supply all the answers immediately, but if it is humanly possible to better your experience, we will be glad to help. It is always a pleasure to dig into difficulties and cooperate with you in reducing them, if not eliminating them entirely. This help is given freely, without obligation, of course. All you need do is *ask*.

• • •

There is much helpful information in "Revere Copper and Copper Alloys—Technical Information for Product Designers." This manual has 54 pages, 106 graphs relating to the physical and metallographic properties of these alloys under varying conditions, a new chemical and physical properties chart, and valuable illustrated data on welding. Ask for your complimentary copy.

REVERE

COPPER AND BRASS INCORPORATED

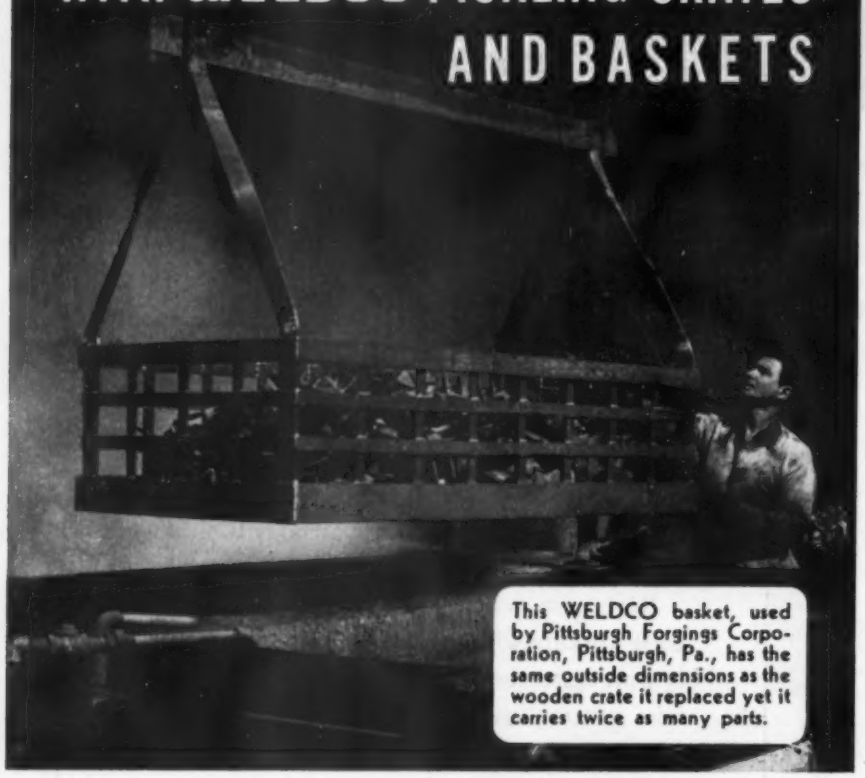
Founded by Paul Revere in 1801

Executive Offices: 230 Park Avenue, New York 17, N. Y.

Revere mill products — sheet, strip, rod, bar, pipe, tube — are stocked by leading metal distributors.

YOUR POWER to produce INCREASES

WITH WELDCO PICKLING CRATES AND BASKETS



This WELDCO basket, used by Pittsburgh Forgings Corporation, Pittsburgh, Pa., has the same outside dimensions as the wooden crate it replaced yet it carries twice as many parts.

Use of Weldco crates and baskets, tailor-made to meet your individual requirements, offers a quick and easy way to increase your pickling capacity without making a major expenditure. Made of Monel, Inconel, stainless steel, and other alloys, Youngstown's WELDCO crates have greater pay-load, bigger safety factor, and longer life. They are highly resistant to corrosion and will withstand bumps and jolts that would fracture crates and baskets made of other materials and by less experienced welders. A large, experienced engineering staff will gladly design and build Weldco crates and baskets to increase your production.

WRITE FOR YOUR COPY OF THIS ILLUSTRATED 16 PAGE CATALOG

WELDCO

THE YOUNGSTOWN WELDING AND ENGINEERING COMPANY

3714 OAKWOOD AVE., YOUNGSTOWN, OHIO

TRADE PUBLICATIONS

AIR PROCESSING "Air Processing" is the title of a catalog just issued by Peters-Dalton, Inc., Detroit 1, Mich., showing installations of dust collecting units and systems, spray booths and equipment, ovens and ventilating and completely engineered air processing systems. Also includes detailed specifications of Hydro-Whirl dust collectors and spray booth units together with engineering data. Make requests on company letterhead.

ASA STANDARD American Standards Association has approved revision of a code aimed at cutting down industrial hazards in the use of woodworking machinery and intended as a guide for the safe installation, operation and maintenance of woodworking machinery. May be ordered from the American Standards Association, 29 West 39 St., New York 18, N. Y., 35 cents.

BENDING PRESSES The Cleveland Crane & Engineering Co., Wickliffe, Ohio, announces Catalog No. 2010-A on Steelweld bending presses. Booklet includes operation photos, details of construction, and table of sizes and dimensions.

BRAZING Handy & Harman, 82 Fulton St., New York 7, N. Y., offers Bulletin No. 14 entitled "How to Repair Broken Cutting Tools with Easy-Flo," a treatise on the subject of repairing broken tools.

CARBIDE TOOLS A 30-page General Tool Catalog GT-175, featuring an expanded line of standard tools available as well as carbide form tools and "Semi-Standard" tools, has been issued by Carboloy Co., Inc., Detroit, Mich.

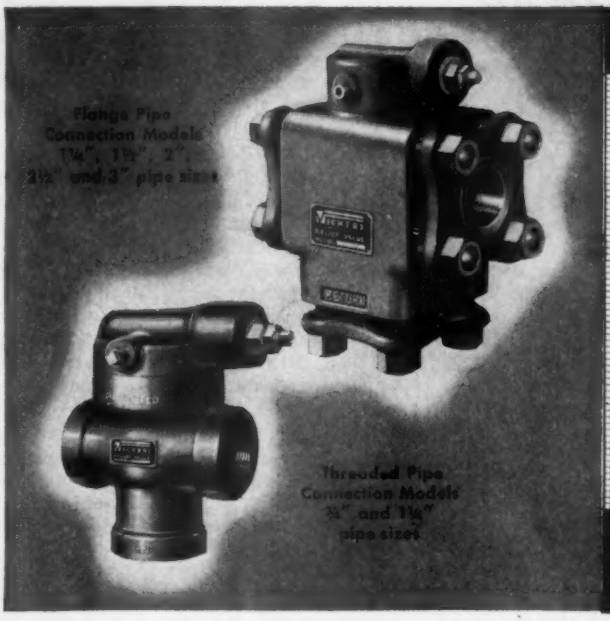
CHAIN BELTS Bulletin No. 436, on agricultural belts, and Bulletin No. 437, on Z-Metal chain belts, are available from the Chain Belt Co., Milwaukee, Wis. Both are fully illustrated and contain complete information on the features, uses and sizes of these belts.

CONTROLS A 16-page booklet on remote controls may be secured from the Adel Precision Products Corp., Burbank, Cal. This bulletin announces the company's ISOdraulic Control, a hydraulic type of remote position control providing immediate response at the remote unit to the position selected at the master unit, and includes complete data and specifications and schematics.

CONTROLS Synchro-Start Products, 221 East Cullerton St., Chicago 16, Ill., has published their 1944 catalog. The first section of this book introduces the company and its officers and takes the reader on a pictorial visit to the various departments of the factory.

MORE ACCURATE

HYDRAULIC PRESSURE CONTROL



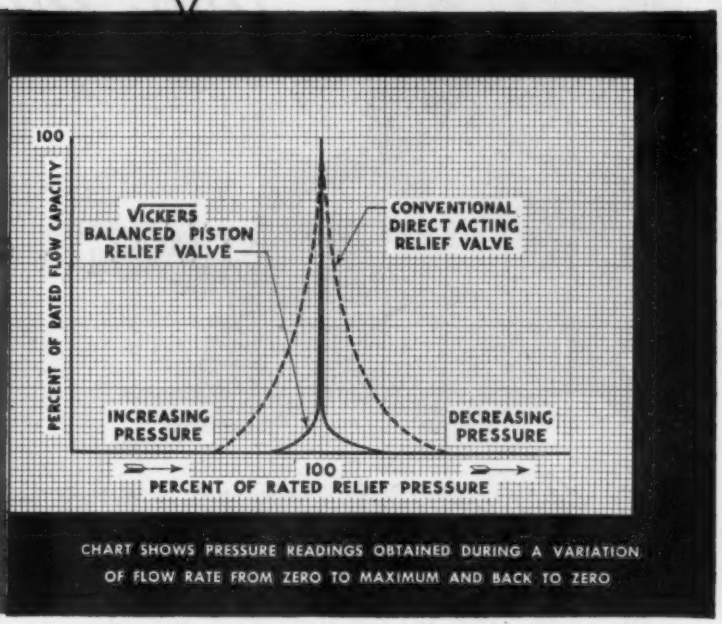


CHART SHOWS PRESSURE READINGS OBTAINED DURING A VARIATION OF FLOW RATE FROM ZERO TO MAXIMUM AND BACK TO ZERO

VICKERS

Balanced Piston Type

RELIEF VALVES

As indicated by the chart above, Vickers Balanced Piston Type Relief Valves have a negligible pressure variation throughout their capacity range. In these valves a hydraulically loaded and balanced piston takes the place of the customary spring-loaded direct-acting relief mechanism. This means more sensitive operation as well as greater accuracy throughout the wide pressure range.

This accuracy of control prevents pressure override when sudden changes in pressure occur in the hydraulic system. Compact design, longer operating life, installation directly in the pressure line, quiet operation, and simple adjustment are other advantages of these Vickers Balanced Piston Relief Valves. See Bulletin 38-3 for complete information.

Vickers Application Engineers will gladly discuss with you how Vickers Hydromotive Controls can be used to your advantage.

VICKERS *Incorporated*

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BILL WEEKS

a No. 1 tool maker

45 years experience as a tool maker—that is a record that few men can equal today! It is a record that Turner is also proud of, for it is skilled men like Bill Weeks who help us attain perfection in the manufacture of precision gauges.

When a boy, railroads appealed to Bill, and he worked in the shops of the Canadian Pacific, Southern Pacific and the Michigan Central. From there his trade took him to the Ford Motor Car Company, The Mercer Tool Company, The Wolverine Tube Company and finally Turner's.

Like most men who work inside, his is an outdoor hobby—specializing in the raising of prize petunias, and he is as skilled at that as he is at turning out fine precision gages.

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TURNER GAUGE GRINDING COMPANY

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PLAST-O-LOCK PLUG GAUGES

The Plast-O-Lock (patent applied for) collet-type gauge was designed by Turner engineers to multiply the life of the gauging surface of standard plug gauges.

This is accomplished by a collet of plastic, that is slotted and tapered to fit into the tapered end of an A. G. D. handle.

Because it is plastic the collet will not scratch or burr the gauging surface, thereby allowing most of the gauge's length to be used.

For descriptive literature and prices write our sales department today.

The second section of the book is made up of bulletins which illustrate and describe the complete line of standard automatic and semi-automatic engine controls.

CUTTING TOOLS A revised pamphlet (Form 2991) entitled "Stellite Star J-Metal Cutting Tools" has been published by Haynes Stellite Co., 30 East 42 St., New York, N. Y. It contains sizes and prices for these tools, data on standard square, rectangular and tipped tools, a list of standard milling cutter blades, detailed information on tool holders and adaptors and sizes, prices and descriptions of "Stellite" alloy wear strips.

FORGE FURNACES Surface Combustion, Toledo, Ohio, announces the release of Folder SC-116 entitled "Surface Combustion Production Forge Furnaces." It illustrates and describes the features and operation of the batch type slot forge furnace and the oil fired continuous slot forge furnace.

GAGE BLOCKS The importance of interchangeability of parts in today's system of mass production and the use and care of the gage blocks and gage instruments play in this system, is the theme of a new folder announced by Continental Machines, Inc., 1301 Washington Ave., South, Minneapolis 4, Minn.

HYDRAULIC PRESSES The Watson-Stillman Co., Roselle, N. J., has issued Bulletin No. 370-A covering a general purpose hydraulic press for use in the metal-forming, ceramic or plastic industries. Included are detailed description of construction and equipment, and specifications for five sizes and capacities. Make requests on company stationery.

INJECTION MOLDING MACHINES The Watson-Stillman Co., Roselle, N. J., has released two bulletins, No. 621-A on horizontal injection molding machines, and No. 622-A on vertical injection molding machines, which describe operating features, show detailed drawings and list specifications. Requests must be made on company letterhead.

INSPECTION Those concerned with the problem of the inspection and control of surface finish will be interested in a folder offered by George Scherr Co., Inc., 128 Lafayette St., New York 13, N. Y. In it is included a complete description of four types of the Spencer binocular microscope, and a table of magnifications.

MAINTENANCE "Piping Pointers for Industrial Maintenance Men" is the title of a 32-page illustrated book especially prepared by the Crane Co., 836 South Michigan Ave., Chicago 5, Ill., to give practical information on to those concerned with the maintenance of valves and fittings in industrial plants.

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PROMPT DELIVERY

Specialization — with full WPB approval — on sizes 3" in diameter and under, means no waiting for Chicago Grinding or Mounted Wheels. Let us take care of your present and post-war requirements.

YES, YOU CAN FINISH IT BETTER WITH A CHICAGO WHEEL

Just as the prelude to a new world is better tools of war, so the prelude to a perfect finish is better grinding wheels.

Today's standards of finishes are far and beyond those of yesterday. To acquire them without sacrifice of production time is a goal which everyone seeks.

Finish must now be measured in micro inches. That's where the new Chicago FV BOND Wheels excel. They give a precision smoothness so intensified that it passes any surface analyzer test, in many cases eliminating hand lapping and auxiliary finishing operations.

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A—Sensational new FV BOND. Result of research and experiment on hundreds of aircraft jobs.

B—No sacrifice of cutting time or wheel life.

FV BOND is available in all types of Chicago Mounted and Small Grinding Wheels—in all abrasives, grain and grade combinations.

FREE ENGINEERING ANALYSIS

If you have a grinding job that presents a problem because of the nature of material, tricky shape or other reason, tell us about it. Our experts will go into a huddle and give you the benefit of our long experience making millions of custom built wheels for every conceivable operation.

TEST WHEEL FREE — To prove their superiority in your own shop, send for a Chicago Wheel made with FV BOND. Give us details of the job, material you want to finish and we'll do the rest.

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Half a Century of Specialization has Established our Reputation as the Small Wheel People of the Abrasive Industry.

MANAGEMENT A plan for shop men and home craftsmen in need of shop tools which they have been unable to obtain due to priorities is described in a booklet entitled "How You Can Obtain Power Tools" offered by the Boice-Crane Co., 935 Central Ave., Toledo 6, Ohio. In addition to this, the booklet also includes new data on their line of band saws, saw jointers, jig saws, belt sanders, and other allied products.

MANAGEMENT The George S. May Business Foundation is distributing three new reports dealing with management matters: No. 148, "How Waste Reduction Boosts Production;" No. 149, "How Business Engineering Benefits Business;" and No. 150, "How Accountancy and Engineering Share in Effective Tool Control."

MATERIALS HANDLING Interesting facts about BROWNSKIN GRIZZLYBEAR, a waterproof, corrosion preventative paper used for packing finished steel and precision parts for delivery to the various theatres of war, are set forth in a folder recently prepared by the Angier Corp., Framingham, Mass.

MEASUREMENT "How to Measure in Micro Inches" is a 20-page booklet designed for both the novice and the expert. It deals with the fundamentals of precision measurements, showing how these principles are applied to production in the daily control of product quality. Many photos show new applications for gage blocks, vernier gages, sine bars and other precision measuring instruments. The booklet may be secured from Continental Machines, Inc., 1301 Washington Ave. South, Minneapolis 4, Minn.

MEASUREMENT Physicists Research Co., Dept. 1, 343 South Main St., Ann Arbor, Mich., have published a revision of their booklet, "Practical Surface-Roughness Measurement," containing information on surface roughness and its measurement, and describing a complete line of Profilometer roughness gaging equipment. It lists specifications and prices of all Profilometer units and accessories.

METAL CLEANING Tivit Products Co., 8024 South Vermont Ave., Los Angeles 44, Cal., have released two bulletins covering their pressure tanks and steam pressure cleansers.

OILERS Bulletins 24-A and 25-A, offered by Trico Fuse Mfg. Co., 2948 North Fifth St., Milwaukee 12, Wis., describe an automatically controlled visible oiling method for ring or ball bearings, shafts, gear and pump housings, and similar applications where the oil supply must be maintained at a certain level.

SPOTLIGHT Sciaky Bros., 4915 West 67th St., Chicago, Ill., have available a four-page bulletin, No. 203-A, telling about their locating spotlight for use in accurately locating work on all blind operations on machines doing

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. . . . . is always up-to-date—NEVER LATE

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. . . Flow of finished parts coordinated to prevent either excessive or unbalanced inventories or assembly delays resulting from missing parts.

. . . Progress record showing immediate status of any or all orders *at a glance* and complete inventory of work-in-process . . . based on primary records—always up-to-date.

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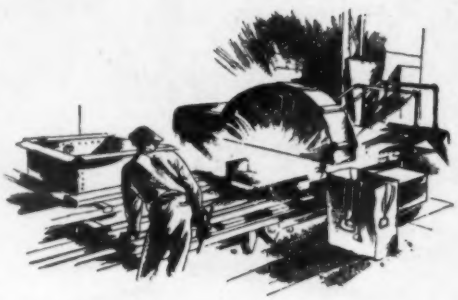
Steel Cut to Close Tolerance. Experienced crews manning high-speed friction saws, giant shears and other metal-working machinery quickly turn out steel —cut, formed or otherwise prepared to your requirements. Steel that is cut to exact specification eliminates scrap—frees man-hours for more production.



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Speedy Delivery Without An Expediter. Every man and woman in our eleven strategically-located plants knows the meaning of the word *rush!* The Ryerson organization is geared to getting your steel delivered in the shortest possible time. Get in touch with your nearby Ryerson plant when you need steel.

Write for your copy of the Ryerson Stock List—complete catalog of steels in stock for immediate shipment including: bars, shapes, plates, sheets, structurals, tubing, carbon and alloy steel, tool steel, Allegheny Stainless and many others.

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riveting, dimpling, punching, shearing and other processes.

SPRINGS A folder illustrating and describing in sequence how large springs are hot-coiled has been published by the Muehlhausen Spring Corp., Logansport, Ind.

STAINLESS STEELS A handy stainless steel identification chart is offered by the Carpenter Steel Co., Reading, Pa. Printed in four colors, the chart diagrams the Stainless Type Numbers and describes eleven tests for separating the various types. The chart is convenient in size and can be used right on the testing table.

SURFACE GRINDER Builders' Iron Foundry, 9 Codding St., Providence 1, R. I., has printed a folder describing and illustrating their "T" surface grinder.

TAPPING MACHINE Bulletin LTM-44 of the Detroit Tap & Tool Co., 8432 Butler St., Detroit 11, Mich., illustrates and describes in detail their improved light-duty tapping machine. Included also is a list of specifications and cutaway views of the machine.

TAPS The Threadwell Tap and Die Co., Greenfield, Mass., is distributing a tap book for use as a practical guide to the best possible results from the use of a tap in cutting internal threads in metals or plastics by hand or machine.

NEW BOOKS

BASIC PROBLEMS IN ENGINEERING DRAWING—*By Wm. W. Turner, head of the department of engineering drawing, University of Notre Dame,* 40 *pages. Published by the Ronald Press Company,* 14 *East* 26 *Street, New York, N. Y.* $1.25.

This work is a compilation of loose-leaf pages, each of which is a specific problem in engineering drawing. The first, for example, shows the typical sizes of lettering used on drawings of various dimensions, and includes a small drawing which must be lettered according to an example given. There are 42 work sheets which cover in logical progression those basic phases of engineering drawing that are commonly given in the first year of a college course, and the mastery of which is one of the important goals of such a course. It is intended that these problems be supplemented by customary lectures and tests, after which these sheets of problems should prove adequate without the assignment of additional drawing problems. They are intended to increase the speed with which a student can learn the fundamentals of engineering drawing.

The problems include lettering, how

to make conventional lines, how to read scales, and the completion of problems in projection. Auxiliary projections, revolutions, double auxiliaries are also included. There are problems in sectional drawing, dimensioning, and isometric drawing. Other problems include screw threads, intersections, and developments. In each case a work sheet includes a complete drawing or portion of a drawing, and the student must either letter or dimension the drawing, find intersections, make sectional views, make developments, or complete sections of this drawing.

•

FUNDAMENTALS OF MECHANICAL INSPECTION—*By Rolland Jenkins, inspection supervisor, Sperry Gyroscope Company,* 179 *pages. Published by McGraw-Hill Book Company,* 330 *West* 42 *Street, New York* 18, *N. Y.* $1.75.

Based on classroom instruction given to hundreds of men and women engaging in inspection work for the first time, this volume serves admirably to supplement such instruction or permit self-study of this broad subject.

After discussing the "what and why" of inspection, Mr. Jenkins covers the basis of all our measurement standards, working drawings and the measurement tools, both precision and non-precision. Other chapters cover the care and use of tools, machining methods, metals and materials and how to inspect difficult pieces.

As a review to those persons new to the field or whose memory may be dimmed by long periods away from inspection work, chapters are included to summarize mechanical inspection terms and the mathematics of inspection.

While not intended as an exhaustive treatise on the subject, this is probably the most complete volume yet published on inspection and its use.

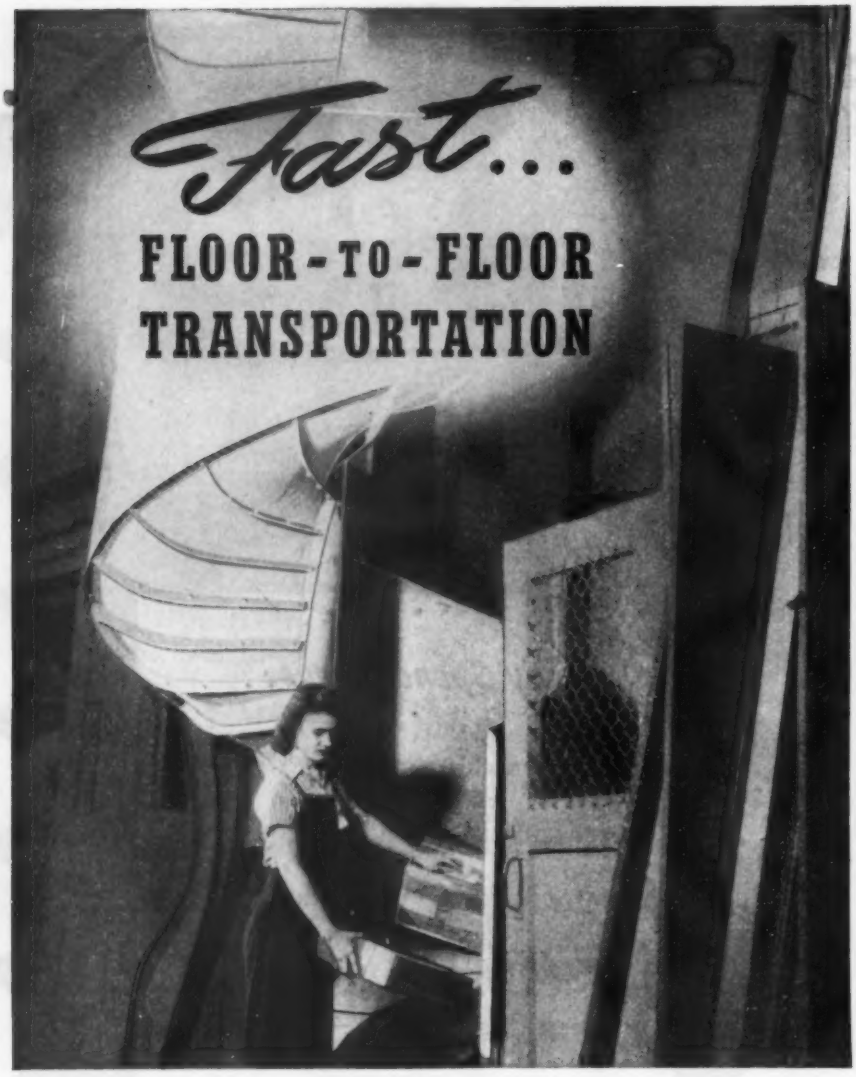
•

DIESEL LOCOMOTIVES—MECHANICAL EQUIPMENT—*By John Draney.* 472 *pages. Published by American Technical Society, Drexel Avenue at* 58 *Street, Chicago, Ill.* $4.

DIESEL LOCOMOTIVES—ELECTRICAL EQUIPMENT—*By John Draney,* 388 *pages. Published by American Technical Society, Drexel Avenue at* 58 *Street, Chicago, Ill.* $3.75.

Many diesel electric locomotives are in service on American railroads, and their development and use are progressing at a rapid rate. Recognition of the value and reliability of the diesel locomotive has been increasing, and with the demand for diesel engines has grown the parallel demand for knowledge regarding the operations, service and maintenance of them. It is the operating engineers and men

Woody Spencer says:
"The making of taps, which are precision tools, requires specialized manufacturing knowledge and experience. Keep this in mind — specify WOOD & SPENCER . . . the finest in taps, produced by a manufacturer who 'knows how'."
The Wood & Spencer Company
Cleveland 3, Ohio



. . . Standard Spiral Chutes move merchandise from upper to lower floors . . . with SPEED and minimum handling cost

If you have material on the second floor—or the twentieth, for that matter—and want to get it to street level or the basement, there are several methods you could use. You could carry it down, step by step, or use an elevator.

A better method — quickest and lowest in cost — is the spiral chute. The spiral chute has volume carrying capacity, runs up no power bills, and is always ready for service. It reduces handling costs and saves time.

Scientifically pitched and skillfully designed spiral chutes are part of Standard's wide line of handling equipment, developed during almost forty years of solving industry's inside-the-plant transportation problems.

Get complete information on Standard Spiral Chutes and how they can be used to advantage for the handling of a wide range of products and merchandise.

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★ ENGINEERED FOR FASTER PRODUCTION ★

in the service and maintenance departments of railroads who will find these books useful.

The author was assisted in the writing of these two books by eminent authorities, including R. T. Sawyer, diesel equipment engineer, American Locomotive Company; Max Essl, chief consulting engineer, Baldwin Locomotive Works; A. H. Candee, transportation engineer, Westinghouse Electric & Mfg. Company; H. B. Ellis, service engineer, Electromotive Division, General Motors Corporation; and C. A. Church, transportation department, General Electric Company.

The first of these two books discusses the characteristics of diesel-engine cycles, combustion principles of modern high-speed diesels, and constructional characteristics of internal-combustion engines used on modern railroad motive power. The latter includes those engines built by the Baldwin Locomotive Works, the American Locomotive Works, the Electromotive Division, General Motors Corporation, and Cooper-Bessemer Corporation. Characteristics of Caterpillar, Cummins, Hercules, and Fairbanks-Morse diesel engines are also described. Details regarding design, operation and maintenance of auxiliary equipment and accessories for diesel engines, including fuel injection systems, lubrication and cooling system, governors, superchargers, air filtration and steam generating units are also included.

The second book, dealing with electrical equipment for diesel locomotives, first deals with the principles of electricity, and then describes transmission and control equipment used in diesel locomotives. The latter includes complete descriptions of locomotives with Baldwin-Westinghouse, Electro-Motive, and American Locomotive Company-General Electric equipment.

•

THE PRACTICAL DESIGN OF WELDING STEEL STRUCTURES—*By H. Malcolm Priest, engineer, Railroad Research Bureau, U. S. Steel Corporation Subsidiaries.* 150 *pages. Published by the American Welding Society,* 33 *West* 39 *Street, New York, N. Y. Price* $1.

Conciseness makes this book an important aid in the preparation and execution of welded designs. Brief but adequate discussions present important data on the various welding processes, specifications for electrodes, types of welds, welding positions, qualification tests and inspection. At greater length, the author treats the important subjects of weld geometry, stress concentration, temperature effects both physical and metallurgical.

Numerous charts facilitate the design of welded joints and structural members. Their derivations in many instances are the codes of the American Welding Society. Mr. Priest first gave a paper on the subject of this book in 1933, dealing largely with bare-wire welding; the current volume brings

that information up to date on the basis of use of shielded-arc electrodes.

Mr. Priest gives a chapter on the subject of structures in which vibration is a factor. He gives test results for butt welds, and tells why the designer must consider the effect of stress raisers.

SEEN and HEARD

By JOHN R. GODFREY

Plastic Valves

Boosters for plastic parts to replace metal will be interested in a Bendix development. It's a check valve to replace dural valves and seats of hardened steel for use in airplane hydraulic systems. Other uses for plastics in somewhat similar lines seem to be a reasonable expectation in the not too distant future.

Wood Comes Back

Typical of the problems created by current material shortages is this excerpt from the letter of a chief maintenance mechanic in a food plant: "Sometimes I wonder whether I am a carpenter or a machinist—things have changed so much in the last year. When we changed over to glass containers, we had to make simultaneous alterations in our entire conveying system. No steel—so we used wood—and you'd be surprised at the results.

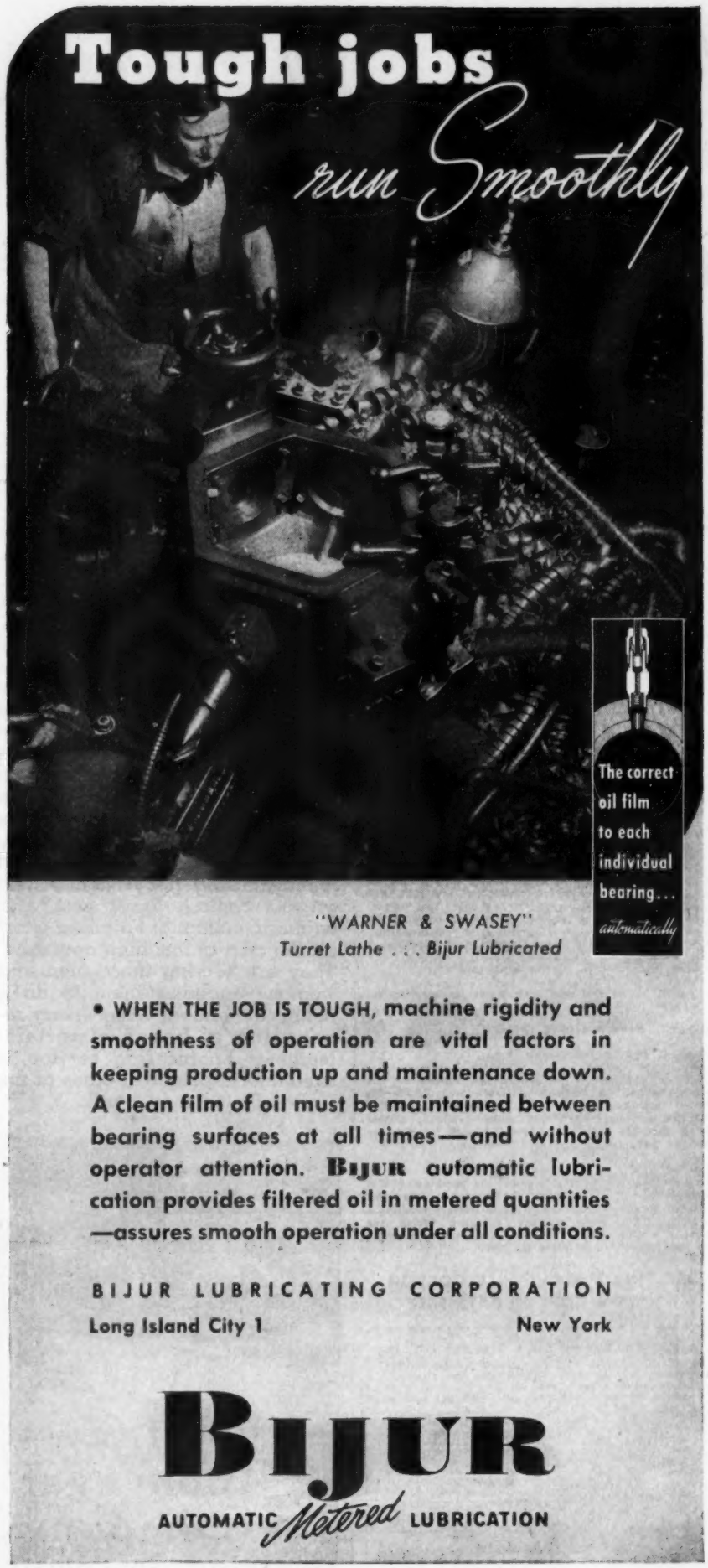
"We found out all over again that wood is a very versatile material. Glass is hard on conveyor and feeding surfaces—it is very abrasive, while the tin on our regular cans is a natural bearing surface. Meantime, exposed steel in the system will scratch the glass and cause fractured containers. Our preference is for brass on these jar guides, but we've found that 1-in. fiber works almost as well. Bumper plates we make of cast iron or wood, bored out for fiber inserts to absorb bounce shock. Leather has replaced sponge rubber (and rubber cement) for roll-down pads on our labeling machines."

Cost of Repair and Salvage

The cost of repairs and salvage is not always appreciated. A man who buys a five-dollar device and is charged three dollars for repairing some seemingly minor defect, feels that he has been robbed. Yet the manufacturer might have been money in pocket, had he refused to repair it.

When a lot of instruments or other devices are going through the plant the cost may be remarkably low. But when a single unit comes in for repair it must be dismantled, the various parts checked, reassembled and tested. This is sure to cost much more than the cost per unit when it was one of a large lot going through the shop.

One way of handling such repairs is


Tough jobs
run Smoothly
The correct oil film to each individual bearing... automatically
"WARNER & SWASEY"
Turret Lathe . . . Bijur Lubricated
• WHEN THE JOB IS TOUGH, machine rigidity and smoothness of operation are vital factors in keeping production up and maintenance down. A clean film of oil must be maintained between bearing surfaces at all times—and without operator attention. BIJUR automatic lubrication provides filtered oil in metered quantities—assures smooth operation under all conditions.
BIJUR LUBRICATING CORPORATION
Long Island City 1 New York
BIJUR
AUTOMATIC Metered LUBRICATION

Brief — Clear — Complete —

a practical introduction to INSPECTION WORK

Here's just the book for the man who wants to know more about mechanical inspection—the guiding purpose, requirements, and basic knowledge of the work—and

how to choose and use fine instruments for accurate measurement

Just Published

Fundamentals of MECHANICAL INSPECTION

By ROLLAND JENKINS

Inspection Supervisor, Sperry Gyroscope Co., Brooklyn

179 pages, 5½ x 7¾, 124 illustrations, $1.75

From the first chapter on THE WHAT AND WHY of inspection to the handy information on materials and machine operations at the end of the book, this manual packs in a surprising amount of helpful material for all concerned with shop and inspection measurements. With clear, to-the-point text and illustrations it tells you:

- what instrument to use for what work
- how to handle and read instruments for required accuracy
- common errors in reading to avoid
- how to care for instruments

All the most widely used tools and instruments are covered—scales, calipers, and dividers—micrometers—the vernier instruments—plug, ring, and snap gages—dial instruments, comparators, air gages—v-blocks, surface plates, parallels—with essential information for correctly applying and making best use of each.

In addition you'll find usable information on inspection procedure, blueprints as the working guides of inspection, the mathematics of inspection, characteristics of industrial materials, work of various machining operations, and other subjects, bringing within the covers of a single book everything necessary to a working knowledge of mechanical inspection.

USE THIS McGRAW-HILL COUPON TO SEE A COPY 10 DAYS FREE

McGraw-Hill Book Co., 330 W. 42nd St., N. Y. 18.
Send me Jenkins—Fundamentals of Mechanical Inspection for 10 days' examination on approval. In 10 days I will send $1.75 plus few cents postage or return book postpaid. (We pay postage if you remit with order.)

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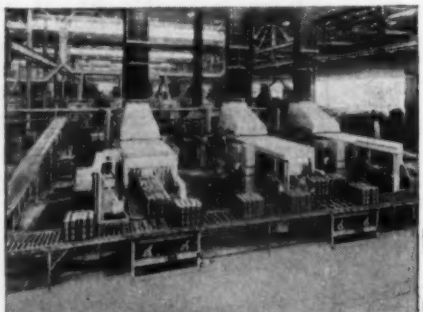
As Manpower Problems grow more acute!

As war production reaches its peak, the manpower situation in industry changes. In most cases the problems are becoming more acute. The demands for men and women for the Armed Forces are heavy. The only recourse, if production is to be maintained, is the use of more women or older men, whenever possible. More than ever, Mathews Engineering is essential. Mathews Gravity and Power Conveyers, and the special devices which make Mathews Systems prominent, are on the job in the great war plants of the United States and Canada, helping to move materials through manufacturing departments, with greater control, lower cost, and with a minimum of fatiguing effort on the part of machine operators. They are serving these men and women — helping them to do a better job without unnecessary rehandling of heavy materials. Mathews Engineering service is available in principal cities of the United States and Canada.



Mathews Conveyer Company

ELLWOOD CITY, PENNSYLVANIA

by a replacement policy in which a new instrument is sent in exchange at a nominal charge. Then when a sufficient number of repairs have been accumulated they are put through the shop as an adjunct to the production line. In this way any repairs or adjustments can be made much more economically than is possible when each is handled separately.

Similarly, attempts at salvage are likely to be disappointing. Generally speaking it rarely pays unless material is scarce and labor plentiful. Rebuilding of a plane, for example, is sure to cost more than the construction of a new one, if materials are available for it.

Magnesium Forgings

There seems to be little doubt as to the increased use of magnesium forgings when they become generally available. Estimates of different plane builders who now use aluminum forgings indicate that from 10 to 30 percent of the parts now made of forged aluminum could be made of magnesium instead.

Developments in Internal Grinding

By John E. Hyler

Among recent developments in the field of internal grinding are several machines to handle special problems, although they are not classed as special purpose machines.

One such machine, having 2½-in. cross-slide travel, a precision graduated dial reading to 0.0001 in. and a wide speed range, is ideal for a variety of jobs where size of pieces handled is not too great.

Where large work must be handled, there is a grinder designed with a gap base. This design permits large diameter work to be swung within the base gap and keeps the work center low for operator convenience. One machine of this type is used extensively for grinding large aircraft parts, big diesel rods and large gears. There being no overhead obstructions, heavy awkward work can be loaded by crane without interference.

If grinding capacity in a plant is not great enough, but circumstances do not justify the installation of an additional internal grinder, there is available a multiple-purpose grinder which does internal and external grinding, facing and taper work. One such machine is equipped with a tool bar for rough turning.

Such dies as those now used for cartridge and bullet manufacture are efficiently finished on a new-type machine which is designed to handle a large volume of work with high accuracy. Both cross- and longitudinal-feed handwheels are graduated to 0.001 in. Also, micrometer adjustment is provided on a positive stop for the longitudinal-feed.

THE ELLSTROMS THANK YOU...

Mr. GRANSTEDT

3117 Lincoln Avenue
San Diego, California
November 26, 1943

Mr. Elmer Ellstrom
c/o Dearborn Gage Company.
22038 Beech Street
Dearborn, Michigan

Dear Mr. Ellstrom:

It was with great interest that I read your company's ad in the November issue of the "Aviation" magazine about your father, Hjalmar Ellstrom, and the real background of the famous Swedish gage blocks.

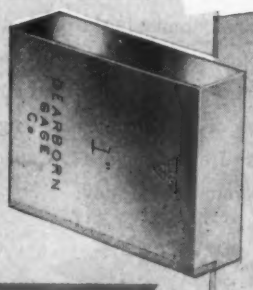
Through my own father I heard a lot about your Dad's and Abrahamsson's primer work on the gage blocks long before C. E. Johansson stepped in and took hold of this great and worldwide important invention. It is not my intention to take any credit away from Johansson and his great work in connection with the famous gage blocks. But I am very glad to be able to, after many years of telling friends and co-workers in toolrooms about your Dad's work, to have something in print to back up my statement.

Yours truly,

G. C. Granstedt

Gustav C. Granstedt

Picture of grandfather Hjalmar Ellstrom taken around 1900.



Elmer Ellstrom

Ralph Ellstrom

Elmer Ellstrom

Olof Ellstrom-
Sgt. in U. S. Army Air Corps

This unsolicited letter from Gustav C. Granstedt brings to light the part that Hjalmar Ellstrom played in pioneering the gage block. Because he never came to America to exploit his discovery his name was not known here until his son Elmer and grandsons Ralph, Elmer and Olof started the Dearborn Gage Co. in 1937.

Today, Ellstrom Chromium Plated Gage Blocks are recognized by industry throughout the world for their longer wearing qualities and fine accuracies.

DEARBORN GAGE COMPANY • 22038 Beech Street • Dearborn, Michigan

Originators of Chromium Plated Gage Blocks

Sand castings
These worm gears are typical products of the Ampco foundry. Precision heat treatment also available.

Centrifugal castings
Ampco pioneered in the centrifugal casting of aluminum bronze, offers long experience and special equipment.

Precision-machined parts
Large, modern machine shop ready to finish castings when desired.

Wrought products
Complete facilities, including extrusion mill for producing rods and bars.

Wear-resisting AMPCO METAL *is available in all its forms from one completely equipped, dependable source*

Let an Ampco Field Engineer give you the benefit of Ampco's 30 years of specialization in aluminum bronzes

Now standard for critical parts in nearly 100 makes of machine tools—in practically every American-built combat plane that flies—in ordnance, heavy machinery, and many another spot subject to wear, shock, fatigue, or corrosion—Ampco Metal is available in so many forms that it gives you great freedom of design for your post-war products. Investigate! Let an Ampco field engineer explain how you can provide parts that last several times as long as ordinary bronze—and give your customers that extra margin of safety that means genuine, lasting satisfaction. Write for bulletins.

A-3

Coated Welding Electrodes
Five grades of Ampco-Trode, for metallic-arc, carbon-arc, or gas welding of practically any combination of metals.

Non-sparking safety tools
Industry's standard, where explosive fumes, gases, or dust are present.

AMPCO
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Metal

The Metal without an Equal

TEAR OUT AND MAIL TODAY

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Milwaukee 4, Wis.

Please send catalog 23 and File 41 of Engineering Data Sheets.

Name_____ Position____

Company_____

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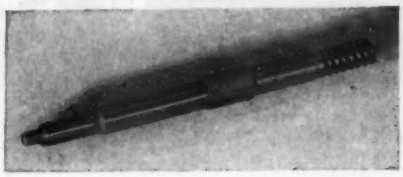
PRECISION PARTS

Hardened for the Tough Grind



Pilots, today, go through a hardening-up process before being turned loose to grind out dangerous bombing missions. The delicate metal parts in a plane are worked up in much the same manner.

Take this accurate little shaft that Ace turns out by the thousands. The worm-threads and diameters are first rough-ground. Next, it goes through a nitriding process to give its surfaces extreme hardness. Then the worm and diameters are finish-ground to very close tolerances, maintaining concentricity and extreme surface hardness.

Here, under one roof, Ace offers manufacturers today the most modern equipment and the engineering ingenuity to put it to practical use. If you have need for small parts and assemblies calling for stamping, machining, heat-treating, or grinding, it will pay you to consult us. Send blueprints, samples, or sketches for quotation.

CENTERLESS GRINDING

The Ace battery of modern centerless grinders offers economies in the production of straight pins, tapered pins, and small-shouldered parts. Equipped to accommodate bar-stock or tubing up to 20′ lengths and diameters from .030″ to 6″. Capacity available for your needs today.

ACE

TRADE MARK

ACE MANUFACTURING CORPORATION
for Precision Parts

1207 E. ERIE AVE., PHILADELPHIA 24, PA.

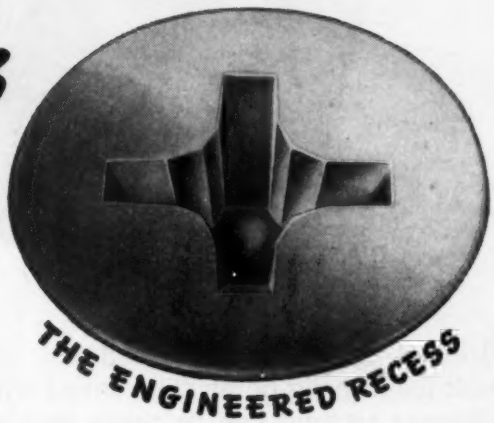
MAKE THIS TEST

AND SEE WHY 90% OF ALL

RECESSED HEAD SCREWS

HAVE THE SAME RECESS

IT'S PHILLIPS



There's nothing like making the *driving test* to convince yourself that there's nothing to match the all-around superiority of the recess design in Phillips Screws! It quickly demonstrates that Phillips is truly a scientifically *engineered* recess in which every angle, every dimension has a definite purpose, contributing to driving ease and speed – and to fastening strength.

Once you make this "driving test" you'll see how Phillips Recess Head Screws fully utilize turning power . . . why your workers can "get going" without fumbling, wobbling, skidding starts . . . can sustain speed and make *consistently tight* fastenings without getting all tuckered out. That's because the driver point *automatically centers* itself in the Phillips Recess, so that screw and driver "handle" like one unit!

You'll also discover that you can set screws up tight without danger of wrecking the Phillips Recess. Those *rounded* corners of the Phillips design will not crush under pressure. And that rugged screw head won't pop off, either, because the Phillips Recess does not weaken it!

The driving test also explains why the Phillips Recess is found in 90 per cent of all assemblies where recessed head screws are used . . . and why Phillips is the only recess ever ok'd by 23 leading screw makers!

To Make Wartime Quotas and Peacetime Profits . . . get the faster starting – faster driving – stronger, better looking fastenings that only screws with Phillips Recessed Head can give you!

PHILLIPS *Recessed Head* SCREWS

WOOD SCREWS • MACHINE SCREWS • SELF-TAPPING SCREWS • STOVE BOLTS

IDENTIFY IT!

Center corners of Phillips Recess are rounded . . .

NOT square.

Bottom of Phillips Recess is nearly flat . . .

NOT tapered to a sharp point.

23 SOURCES

American Screw Co., Providence, R. I.
Atlantic Screw Works, Hartford, Conn.
The Bristol Co., Waterbury, Conn.
Central Screw Co., Chicago, Ill.
Chandler Products Corp., Cleveland, Ohio
Continental Screw Co., New Bedford, Mass.
The Corbin Screw Corp., New Britain, Conn.
General Screw Mfg. Co., Chicago, Ill.
The H. M. Harper Co., Chicago, Ill.
International Screw Co., Detroit, Mich.
The Lamson & Sessions Co., Cleveland, Ohio
Manufacturers Screw Products, Chicago, Ill.
Milford Rivet and Machine Co., Milford, Conn.
The National Screw & Mfg. Co., Cleveland, Ohio
New England Screw Co., Keene, N. H.
Parker-Kalon Corp., New York, N. Y.
Pawtucket Screw Co., Pawtucket, R. I.
Pheoll Manufacturing Co., Chicago, Ill.
Reading Screw Co., Norristown, Pa.
Russell Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Manufacturing Co., Waterville, Conn.
Shakeproof Inc., Chicago, Ill.
The Southington Hardware Mfg. Co., Southington, Conn.

15 holes in 15 minutes!

WITH THE MOORE JIG BORER

Greater accuracy and speed are what you look for in a jig borer. The speed with which accurate settings can be made on the Moore Jig Borer is best shown by the following demonstration, frequently made before witnesses:

Fifteen 3/32" holes, spaced evenly .500" apart, are spotted, drilled and reamed on a template of ⅛" ground stock, to a tolerance of ±.0002"—in less than fifteen minutes. In less than sixty seconds each hole is located accurately! If one boring cut were to be made in order to increase the accuracy to ±.0001", the time for all fifteen holes would be increased by only five minutes.

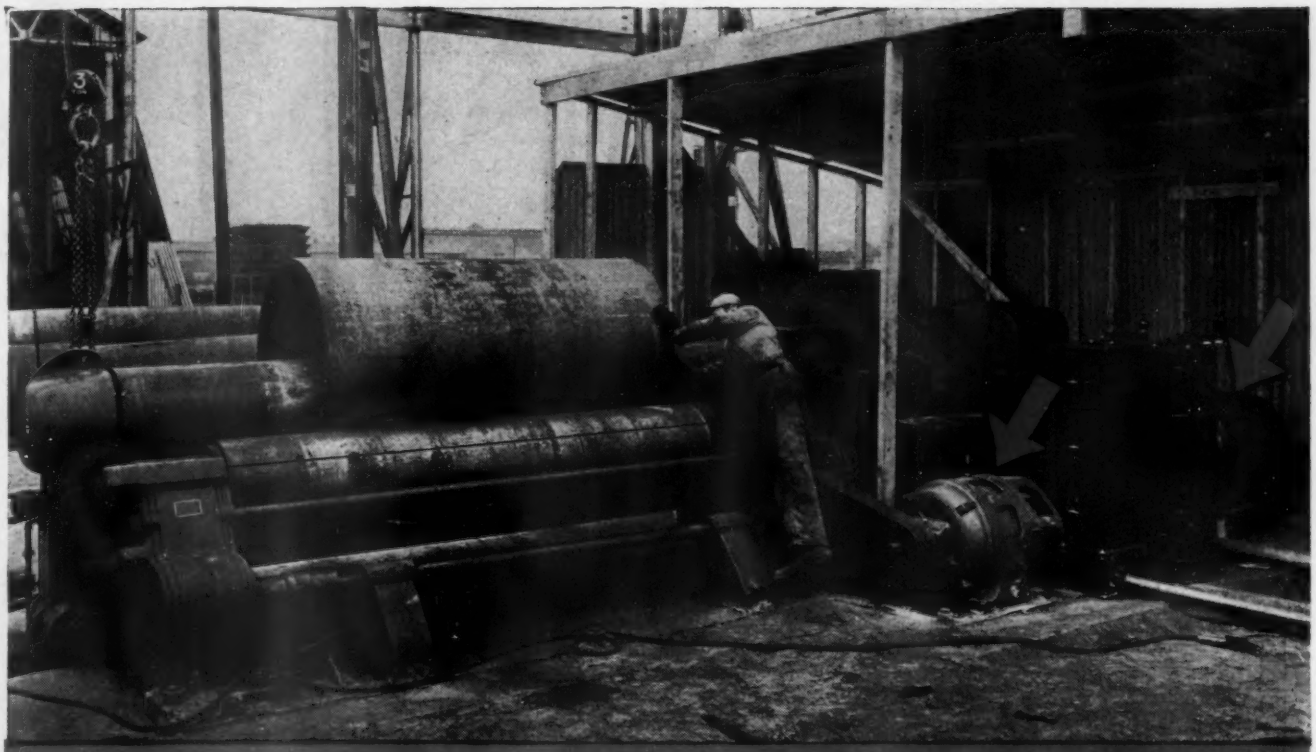
We do not believe that a similar performance is possible with any other type of jig borer. This unprecedented combination of accuracy and speed is the result of lead screws produced by us under the most advanced methods and ground to a degree of precision never achieved before. They enable the most efficient application in the Moore Jig Borer of the fundamental Coordinate Location System. By means of the two lead screws, working at right angles to each other, the workpiece may be moved into any desired position in relation to the fixed spindle. The operator can set the table instantly and check himself without fear of error.

PARTNERS IN PRODUCTION... *The Moore Jig Grinder* corrects hole distortions after hardening. Among its many operation features is the means of rapid location described above for the Jig Borer. Learn how these two machines will modernize your toolroom operations. Send for illustrated literature *today*.

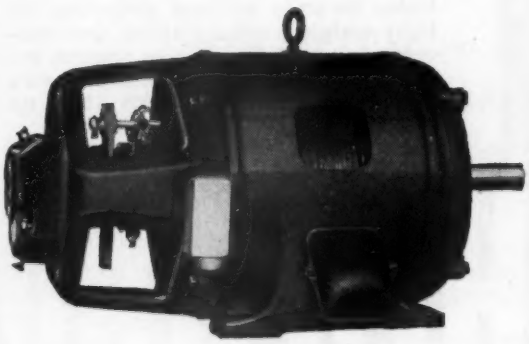
MOORE MAKES TOOLS

MOORE SPECIAL TOOL COMPANY INC.

740 UNION AVENUE, BRIDGEPORT 7, CONN.



CENTURY SLIP RING MOTORS Meet Varying Power Demands In Heavy Plate Forming Operations



Two Century Slip Ring motors operate this plate forming machine. One 30 horsepower Century Slip Ring motor operates the adjustable roll that controls the curvature of the plate. The other, a 75 horsepower Century Slip Ring motor, operates the rolls that force the steel plate through the machine.

Steel plates in varying thicknesses, up to 1⅞", are formed on this machine. Century Slip Ring motors provide the variable speeds and torques to meet these unusual demands.

Century application engineers may be of assistance in solving your problem. Call him in.

Century motors are built in sizes up to 600 horsepower.

Century C MOTORS

380

CENTURY ELECTRIC COMPANY, 1806 Pine Street, St. Louis 3, Missouri

Offices and Stock Points in Principal Cities

STA-KOOL
TOOL HOLDER

This new, patented diamond tool holder provides a fast, accurate method of meeting every requirement in dressing and truing operations. Equipped with internal coolant ducts for wet grinding, and external cooling fins for dry grinding, metal setting as well as stone are kept at safe operating temperatures, eliminating diamond breakage, due to overheating. Thus, tool life is increased, resulting in savings from 30 to 50% in diamond dressing and truing costs. For finish-dressing SMITITE Diamond Tools are available, in which the stones may be completely consumed without resetting. ***Catalog on request.***

J. K. SMIT & SONS

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Super Materials Ignite Triumphs

an element of Victory

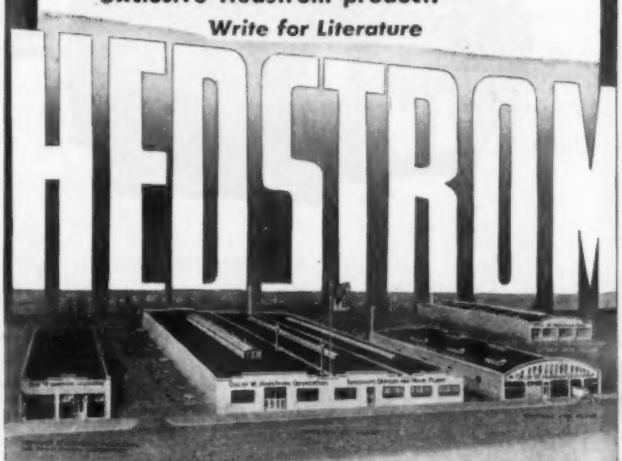
OH 38

Easily Machinable

An Aluminum Alloy—Non-Heat Treated. The perfected metal that surpasses all others for a wide variety of machining operations. Non-corrosive—Easy on machine tools—Holds threads without stripping. Its light weight reduces table and machine loads and increases tooling accuracy. 5 years of proven superiority in hundreds of plants. OH 38 is an exclusive Hedstrom product.

Write for Literature

HEDSTROM



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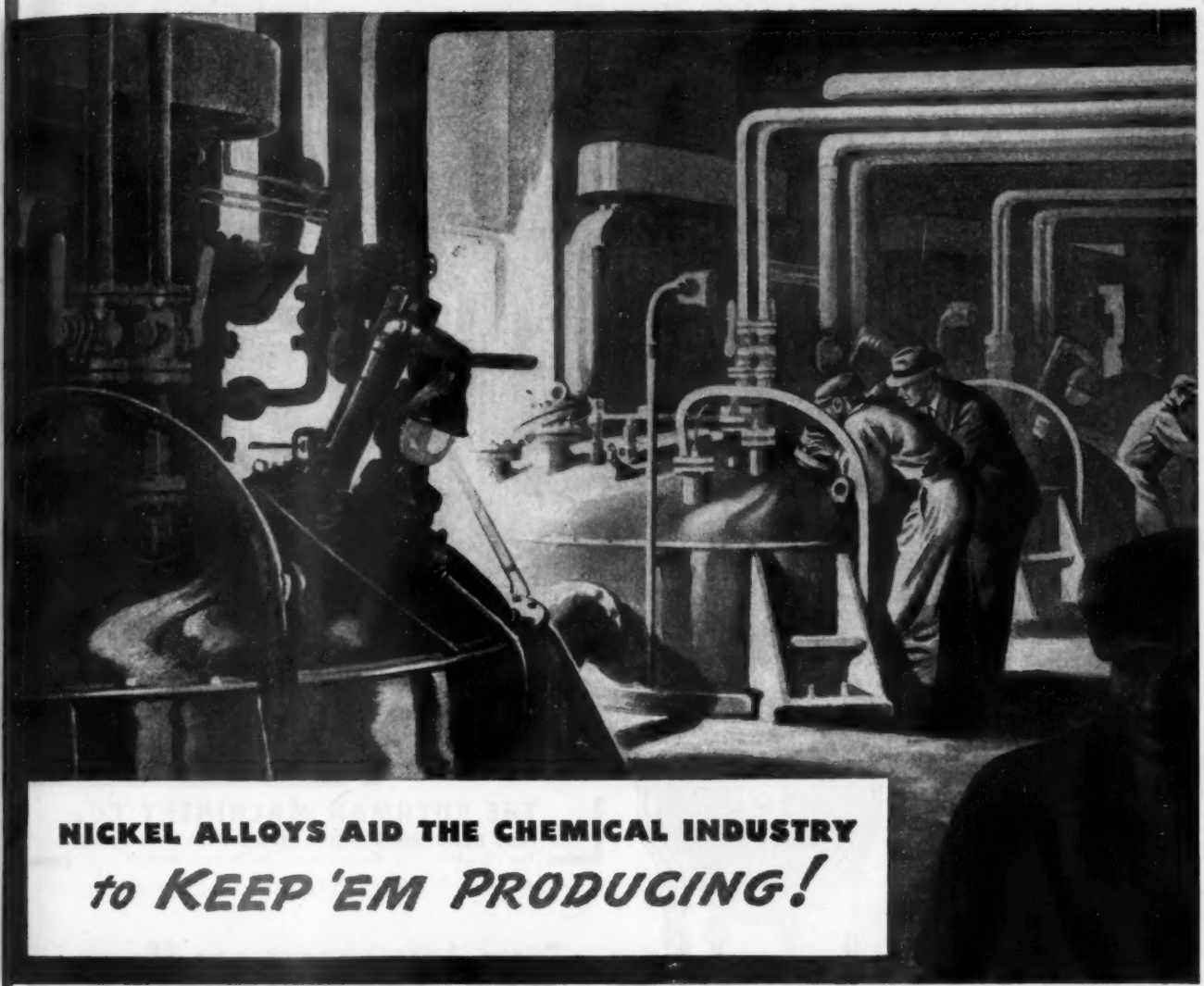
4812 West Division St., Phone Columbus 3667, Chicago, Ill.

Manufacturers of Aluminum, Brass, Bronze and High Conductivity Copper Castings. Pattern Makers. Complete Mechanical Assemblies and Models to Specifications



NICKEL ALLOYS AID THE CHEMICAL INDUSTRY

to KEEP 'EM PRODUCING!

Stainless Steel Lined Polymerization Reactors in Synthetic Rubber Plant

Equipment of Stainless Steel, Nickel and Monel meets many specialized requirements

Chemical engineers have met America's wartime challenge.

They opened the gates to a mighty flood of products going to war... strategic raw materials, synthetic substitutes, and entirely new substances having advantages all their own.

A factor in this production success is the wide use of stainless steel, Monel, and other corrosion-resistant alloys containing Nickel.

For in the chemical industry corrosion is a large-scale menace.

To wage war on this enemy, chemical engineers enlisted the aid of Nickel, because Nickel imparts to other metals strength and resistance to corrosion and wear. In the chemical field, as in many others, a little Nickel goes a long way to keep equipment producing.

It prolongs the life of processing apparatus, and protects the purity, color, and uniformity of the product.

Hence, stainless and Nickel alloys are specified widely for acid heaters and caustic coolers, for high-pressure autoclaves and vacuum evaporators, for cracking towers and polymerization reactors, for shipping drums and tank cars, for pumps, piping and storage tanks, for agitators and settlers, for stills and digestors—for every type of equipment that converts laboratory experiments into full-scale chemical operations.

For years we have enjoyed the privilege of cooperating with technical men of the chemical industry... and of many others. Whatever your industry may be ... if you want help in the selection, fabrication, and heat treatment of alloys ... we offer you counsel and data.

New Catalog Index

New Catalog C makes it easy for you to get Nickel literature. It gives you capsule synopses of booklets and bulletins on a wide variety of subjects—from industrial applications to metallurgical data and working instructions. Why not send for your copy of Catalog C today?

* Nickel *

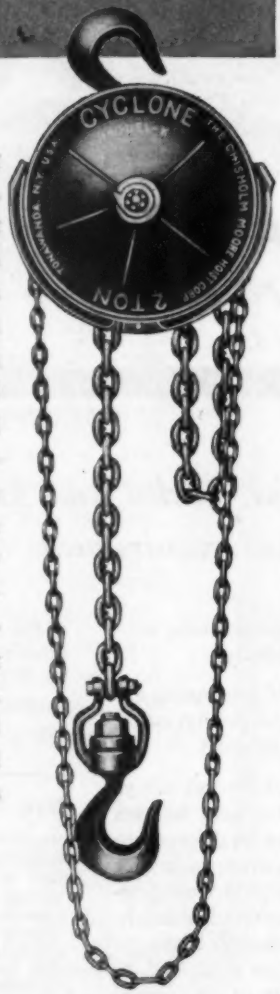
THE INTERNATIONAL NICKEL COMPANY, INC., *67 Wall St., New York 5, N. Y.*

CM

Here's a hand operated hoist with

12 BEARINGS!

CYCLONE



Faster action, higher operating efficiency, lasting endurance, easier handling—that's what you get in the aptly named High Speed CYCLONE Hoist. You can depend on this "tops in performance," because only in the CM Cyclone will you find **12** anti-friction bearings—a ball or roller bearing at *every* rotating point. Other extra value features are: Extra safety from the smooth gyrating yoke action... internal guides to prevent load chain slippage... accurate meshing of machine cut gears... shielded lift wheel... CM "Inswell" electric weld load chain. For a hand operated chain hoist here, definitely, is outstanding value.

Capacities from ¼ ton up. CM Bulletin No. 100 contains complete details. Write for it.

CHISHOLM-MOORE
HOIST CORPORATION

(Affiliated with Columbus-McKinnon Chain Corporation)

GENERAL OFFICES AND FACTORIES: 128 Fremont Ave., TONAWANDA, N.Y.

SALES OFFICES: New York, Chicago, Cleveland, San Francisco, Los Angeles.

"NO OUTSIDE PIPING.."

with this type

GUSHER COOLANT PUMP

Suited for today's high-speed production, Gusher Coolant Pumps help you to meet the most urgent production schedules. Simple in design, troublefree, efficient, dependable. Our line includes immersed types, tank units, flange-mounted types; also plain-shaft and belt-driven types. From a dribble to 200 g.p.m. — 1/10 to 2 H.P.

Write for complete new catalog indexed for quick reference.

See Section 5 of New Catalog

Gusher Pumps Patented and Patents Pending

Internal discharge through center of intake eliminates piping.

THE RUTHMAN MACHINERY CO.
1809 READING ROAD CINCINNATI 2, OHIO

The "Gusher" — A Modern Pump for Modern Machine Tools.

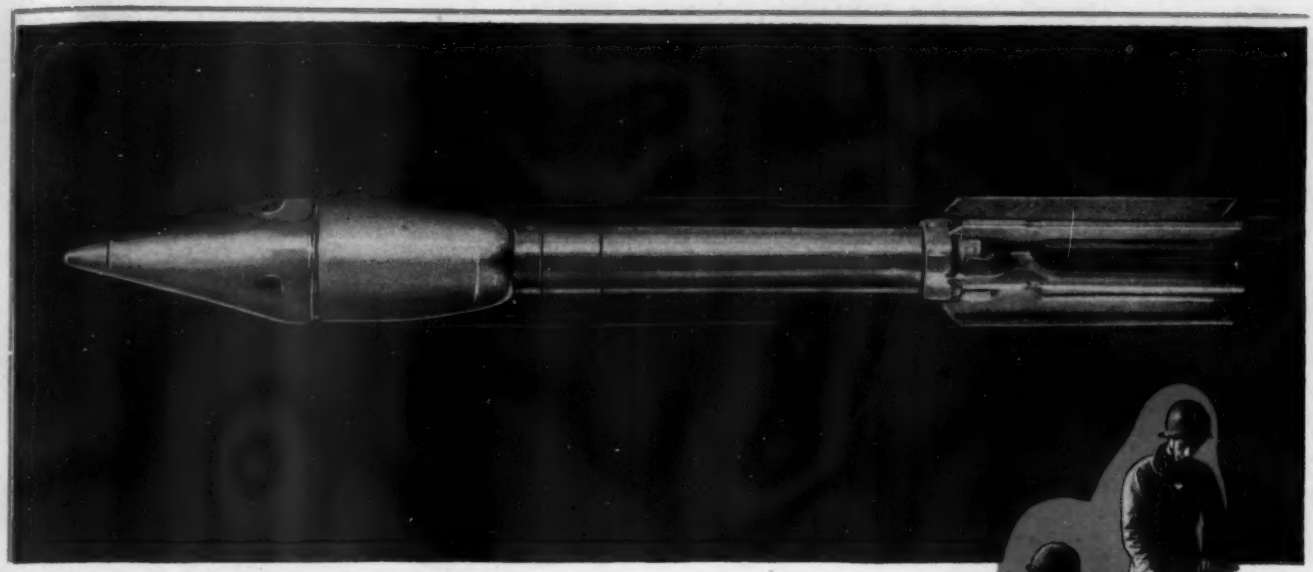
THEIR ADVANTAGES ARE MANY—
MOTOR DRIVEN PUMP UNITS

B·S

Furnished with pump on one or both ends of motor. Pumps can be of same or different styles. One unit can serve two separate systems. Catalog listing complete line sent upon request. Brown & Sharpe Mfg. Co., Providence 1, R. I.

GEARED—VANE—CENTRIFUGAL—MOTOR DRIVEN

BROWN & SHARPE PUMPS



U. S. Army Signal Corps Photo

BAZOOKAS and BOMBERS

Wind-resistance must be reduced to a minimum in bazooka shells and bomber wings—rubber-cushioned Brightboy Abrasives get the call for the close-tolerance de-burring, finishing and polishing of these vital implements of war.

Brightboy abrasive is impregnated throughout the binder; the resiliency of the rubber *controls* the abrasive action. *In a single operation*, Brightboy does an all-in-one job —bridging the gap between the grind and the buff. The finish frequently serves as the final polish. Brightboy is made in a wide variety of shapes and sizes for machine and manual work.

Ask our Service Department or field representatives how to save time — improve quality — in your abrasive finishing. Ask your dealer for prices and Applications Data.

BRIGHTBOY INDUSTRIAL DIVISION

Weldon Roberts Rubber Co. **Newark 7, N. J.**

WELDON ROBERTS

Brightboy

"We knew that

AMERICAN PHILLIPS SCREWS

Make Stronger Fastenings Faster...

Now we know, too, that they Cost Less to Use!"

Anyone can see that American Phillips Screws are the fastest and easiest means of assembly, as well as the most effective protection against spoiled work. And those who scan the cost-sheets can see, too . . . how quickly American Phillips Screws write off their own investment and build a healthy margin over on the credit side.

These savings come both from Phillips engineered design of tapered recess and driver . . . and from American production-control which consistently delivers screws of uniform quality and size, individually inspected for accuracy and serviceability of head, thread, and point. So "buy American," and get these savings for yourself.

AMERICAN SCREW COMPANY

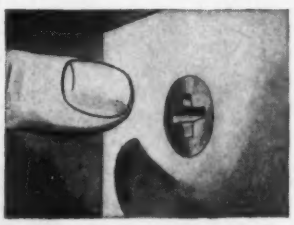
PROVIDENCE 1, RHODE ISLAND

Chicago 11: 589 E. Illinois Street *Detroit 2:* 502 Stephenson Building

ONLY PHILLIPS SCREWS HAVE THE ENGINEERED, TAPERED RECESS

...and here's WHY American Phillips Screws COST LESS on any Screw Driving job

1. **Faster Starting**—One hand holds driver, other holds work. No wobbling, no dropped screws. Phillips screw and driver remain as one self-aligned unit until screw is driven.

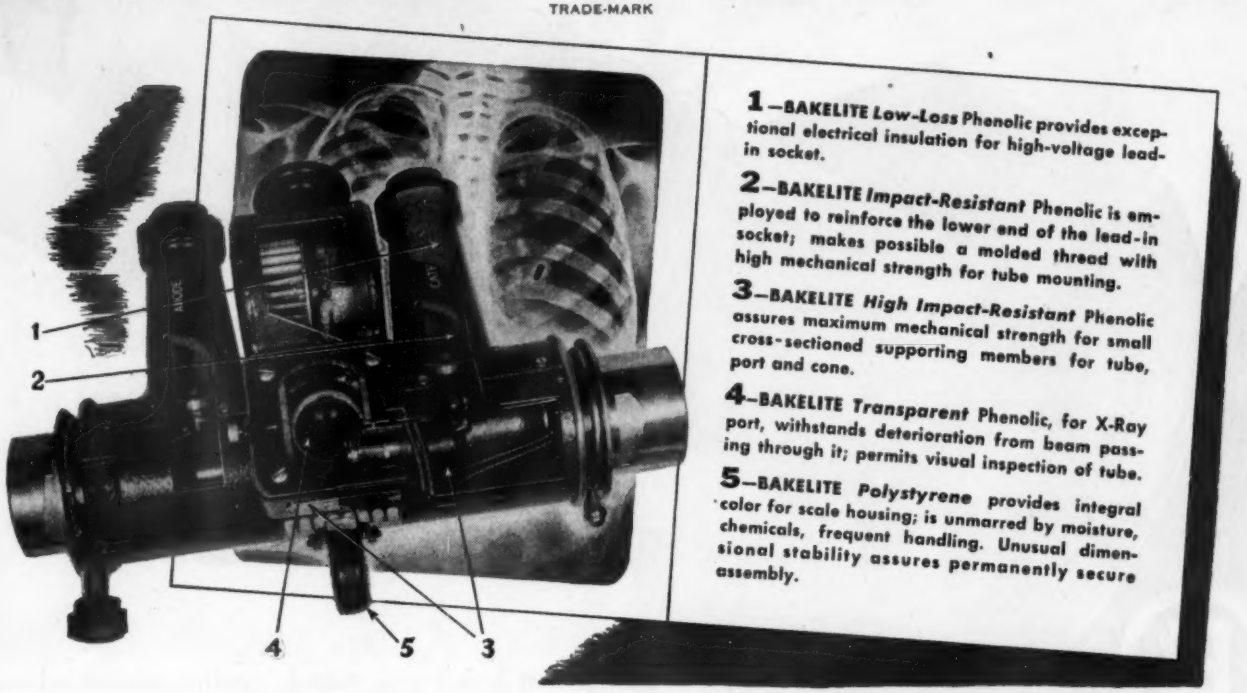


2. **Cleaner Fastenings,**—*every time.* No slanted screws to back out: No gouged work-surfaces, or burred screw-heads. Even unskilled workers get skilled results right from the start.

Put the Screws on the Axis... BUY WAR BONDS!

BAKELITE

TRADE-MARK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2
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3
1—BAKELITE Low-Loss Phenolic provides exceptional electrical insulation for high-voltage lead-in socket.
2—BAKELITE Impact-Resistant Phenolic is employed to reinforce the lower end of the lead-in socket; makes possible a molded thread with high mechanical strength for tube mounting.
3—BAKELITE High Impact-Resistant Phenolic assures maximum mechanical strength for small cross-sectioned supporting members for tube, port and cone.
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5—BAKELITE Polystyrene provides integral color for scale housing; is unmarred by moisture, chemicals, frequent handling. Unusual dimensional stability assures permanently secure assembly.

FIVE DIFFERENT PLASTICS *TO FIND A BULLET— IN A FIELD HOSPITAL*

This "Airflow" X-Ray Tubehead, heart of a mobile X-Ray Unit for the armed forces made by Picker X-Ray Corporation, New York, must be practically indestructible. It must function dependably despite the shocks of sea battle or land travel—despite Arctic cold or blistering desert heat. Actually, this complex, high-voltage electrical unit is a "miniature catalog" of BAKELITE Molding Plastics—proof again that there is a *right* plastic for every condition of service.

In this one unit, problems of impact and vibration, temperature extremes, high voltage, corrosion, transparency, and color-permanency are met and solved with BAKELITE plastic parts.

This plastics success resulted from the cooperation of a three-way team—the designer, the fabricator, and the plastic materials supplier. The same success can be achieved in your essential products, if you call upon Bakelite Field Engineers for help. To learn more about the characteristics of the BAKELITE Molding Plastics used here, write for Booklet 1-P. "A Simplified Guide To Bakelite Plastics."

BAKELITE CORPORATION, 30 E. 42 St., New York 17

Unit of Union Carbide and Carbon Corporation

UCC

Molding Plastics

BROTHERS

under the skin

Select the finish you need; cadmium—lead—nickel —zinc—parkerized—galvanized. Beneath this smooth protective coating, Buffalo bolts and nuts are all of the same uniform quality. Whenever your product is fastened with a circle Ⓑ bolt, you can be sure of its strength and dependability.

ARMY E NAVY

BUFFALO BOLT COMPANY

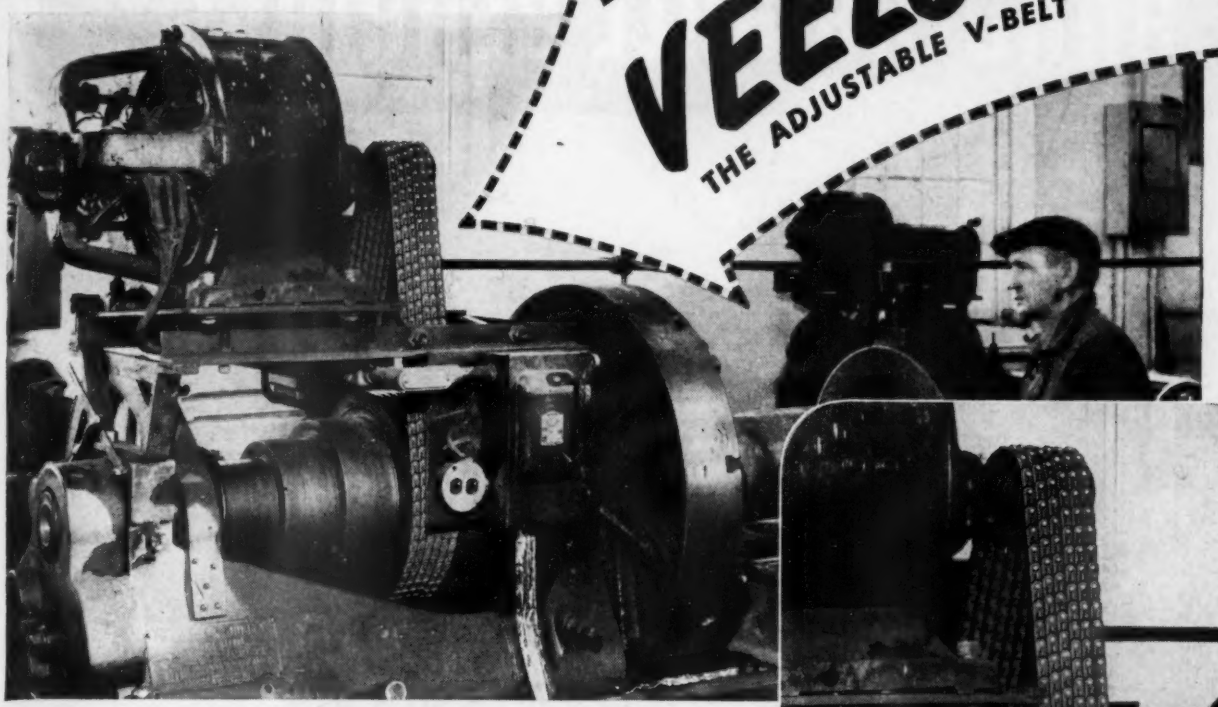
NORTH TONAWANDA, N. Y.

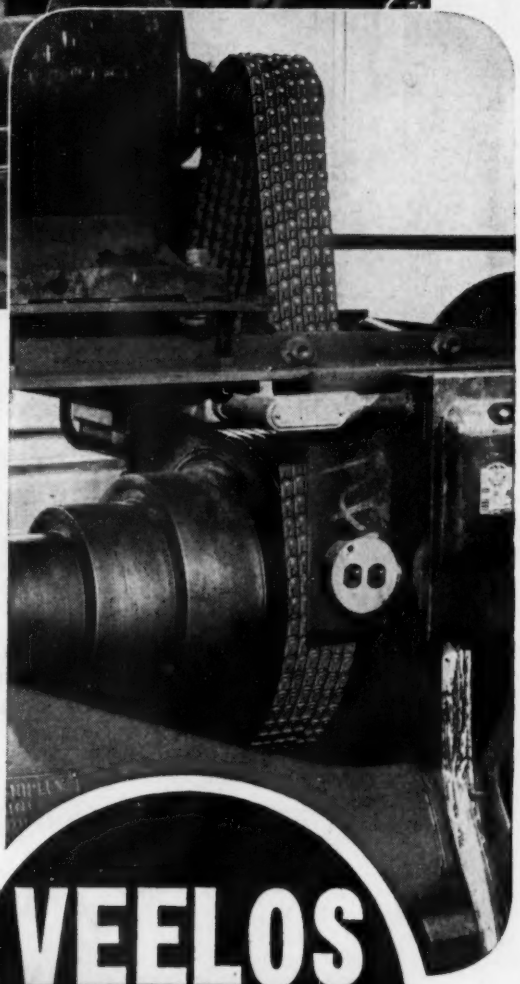
SALES OFFICES IN PRINCIPAL CITIES

A section of Buffalo Bolt Company's modern galvanizing department.

TAKE THE BELT APART . . .
NOT THE MACHINE!

VEELOS
THE ADJUSTABLE V-BELT

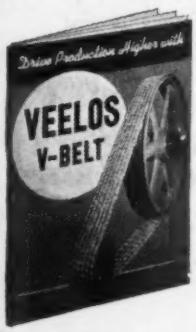




Six strand Veelos V-belt on engine lathe. *This belt operates twenty-four hours a day, six days a week and has been in continous operation since installed twelve months ago. Starting torque is high.*

THE VEELOS drive illustrated was chosen for use by a leading Pennsylvania metal working plant principally because "Veelos V-belts eliminate taking the machine apart to install or adjust belts." With Veelos link construction, *you take the belt apart . . . not the machine!*

Prior to the use of Veelos, flat belt line shaft drives were used for transmitting power. The change-over to a modern, individual motorized drive was simplified by use of Veelos V-belts. With Veelos, there are no obstacles to belt replacement and belt adjustment on any outboard bearing drive. Veelos is made in all standard sizes—fits all standard grooves.



Probably Veelos can cut machine down-time—increase production—in your plant. It will pay you to find out.

Write today for *free 8-page illustrated manual* giving Veelos applications, construction detail, installation directions and engineering data.

MANHEIM MANUFACTURING & BELTING CO.
MANHEIM, PENNSYLVANIA

VEELOS
THE LINK
V-BELT
ADJUSTABLE TO ANY LENGTH
ADAPTABLE TO ANY DRIVE

LINK CONSTRUCTION UPS PRODUCTION

"Commercial"
ANNULAR BALL BEARINGS

Strength
Capacity
Endurance

FOR THE DURATION, WE ARE UNABLE TO SUPPLY MANY TYPES OF BEARINGS FORMERLY MANUFACTURED

THE SCHATZ MANUFACTURING CO.
POUGHKEEPSIE, N. Y.

REPRESENTATIVES LOCATED AT
Detroit: 2640 Book Tower • Cleveland: 402 Swetland Building
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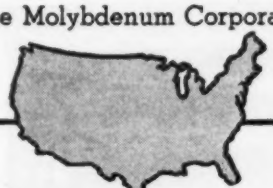
Five points more of

MOLYBDENUM *would have done it!*

Often, while the use of Molybdenum was restricted by Government order, it was hard to get the required physical properties in high-grade steels. And in many troublesome cases, as little as five points more of Molybdenum would have assured success.

There is now no such difficulty. Since the beginning of the year, restrictions are off. There is Molybdenum for all uses. It is necessary only to know what percentage of Molybdenum will give the best result, and to employ that percentage. Inquiries concerning any use of Molybdenum, Tungsten, or Boron will be welcomed by the Molybdenum Corporation.



AMERICAN Production, American Distribution, American Control—Completely Integrated.
Offices: Pittsburgh, New York, Chicago, Detroit, Los Angeles, San Francisco, Seattle.
Sales Representatives: Edgar L. Fink, Detroit; H. C. Donaldson & Co., Los Angeles, San Francisco, Seattle.

MOLYBDENUM CORPORATION OF AMERICA
GRANT BUILDING, PITTSBURGH, PA.

MCA

Strong

LIKE THE COUNTRY THEY SERVE

HALLOWELL

WORK BENCHES

Fig. 928
"Hallowell" Work-bench. Laminated wood top. Drawer is extra Pat'd and Pats. Pending

You can always count on "Hallowell" Work-Benches to stand firm wherever they're installed. Sturdily built, they have strong legs of steel, flanged and ribbed for reinforcement—tied together with flanged stringers into an extremely rigid structural unit. Benches require no bolting to the floor, thereby saving installation time and cost.

"Hallowell" Work-Benches also offer a greatly varied selection from which to choose—they're made in 1367 interchangeable combinations!

For use where the installation of steel equipment is war-restricted, you can now get "Hallowell" Duration Type Work-Benches of wood. Also available in wood "for the duration" are famous "Hallowell" stools, foremen's desks and tool stands.

Fully illustrated bulletins of Work-Benches and other shop equipment in the "Hallowell" line gladly sent upon request.

"Hallowell" De luxe Shop Furniture for post-war use

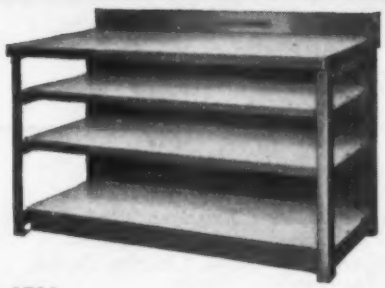


Fig. 1724
"Hallowell" Bench. Open unit — with backboard and three adjustable shelves.

Designed to better meet specific functional needs of modern industry, "Hallowell" De luxe Shop Furniture will be available shortly after the war. These new work-benches, desks, tool stands, chairs, etc. will have the same outstanding sturdiness and durability that characterize present "Hallowell" items. Their standardized construction with interchangeable shelf, cabinet and drawer units will meet practically any requirement.

Over 40 Years in Business

Fig. 1734
"Hallowell" Bench, with backboard, lower shelf and two receding door cabinets, one unit open.

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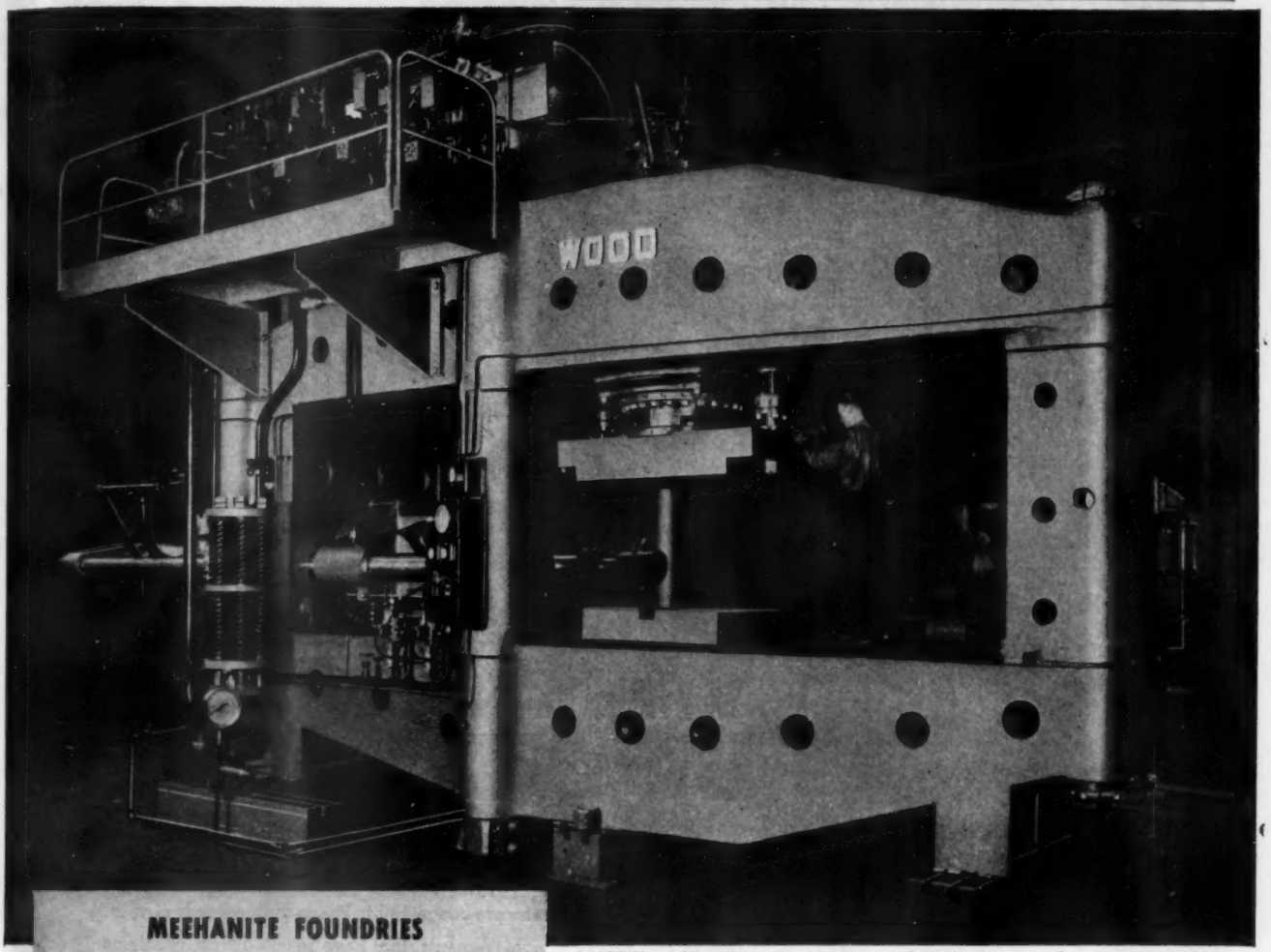

20,575 lb. of Meehanite Castings are used in construction of this upsetting press.

. . . IN THIS CUSTOM-BUILT PRESS

At the Pittsburgh Steel Company's addition to its Allenport, Pa., plant for the production of tubular railway axles, the manufacturing process depends mainly upon this large tube upsetting press built by the R. D. Wood Company, Philadelphia, Pa.

As is the case in so many new designs for special equipment, important parts are Meehanite Castings. In this custom-built press the following Meehanite Castings were used:

Quantity	Part	Finished Weight
1	Horizontal Ram	11,500 lb.
2	Pistons	55 lb. each
2	Pull Back Covers	35 lb. each
1	Vertical Ram	7,400 lb.
2	Rollers	115 lb. each
2	Rails	270 lb. each
1	Stripper Ram	725 lb. each

These castings contribute the required high strength, resistance to wear and structural soundness essential to this equipment.

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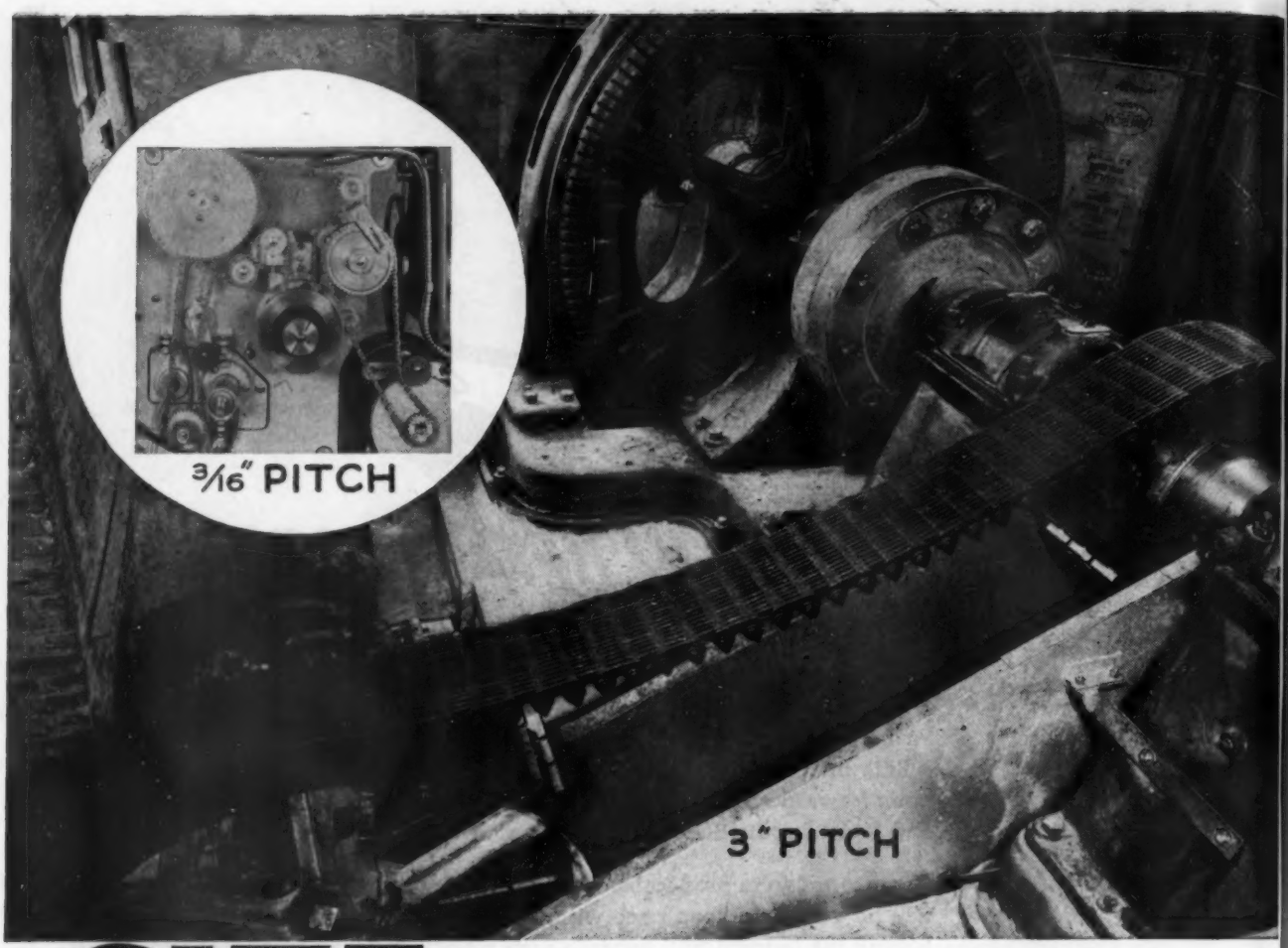

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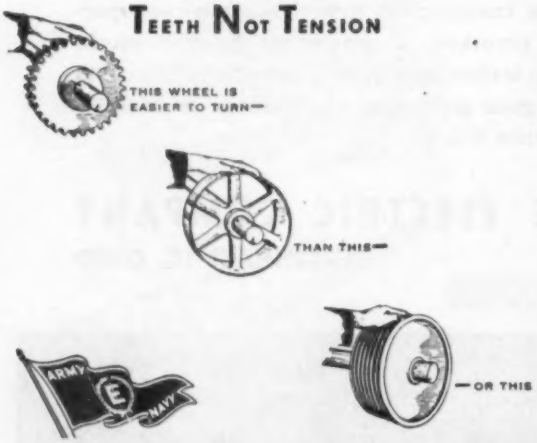

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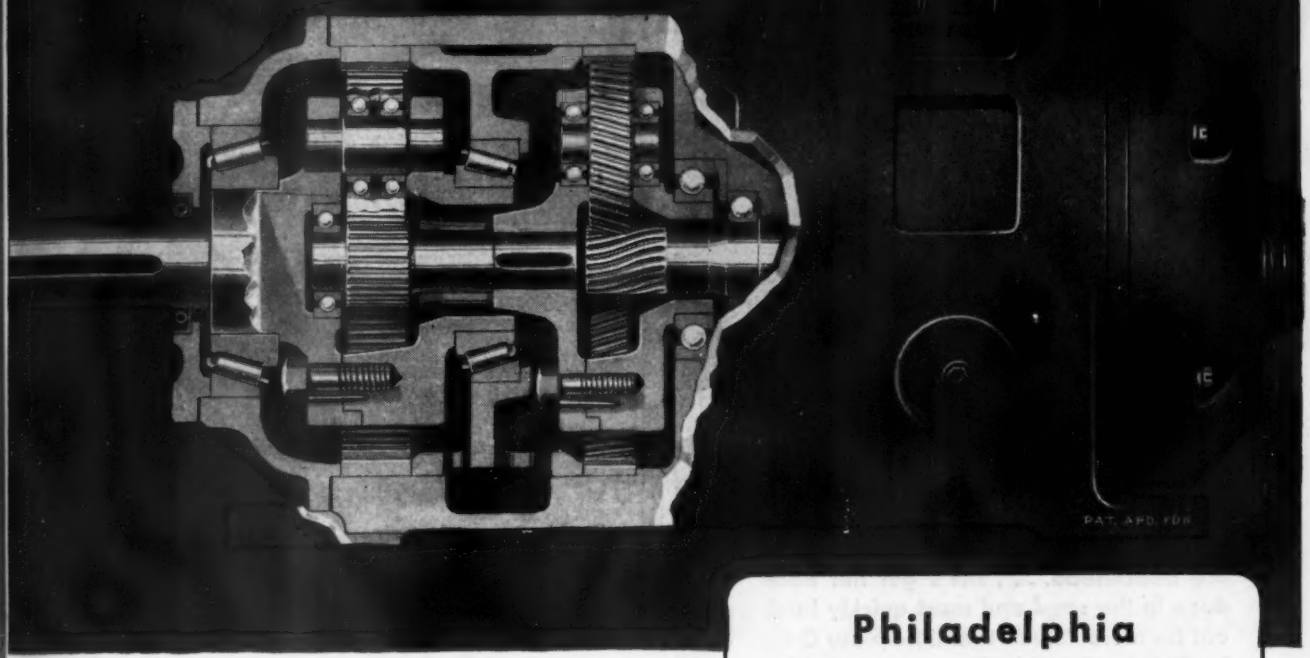

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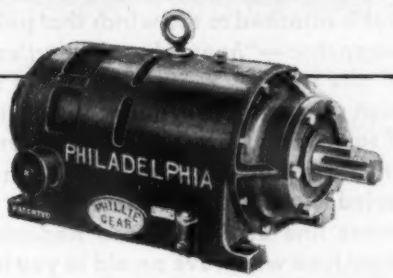

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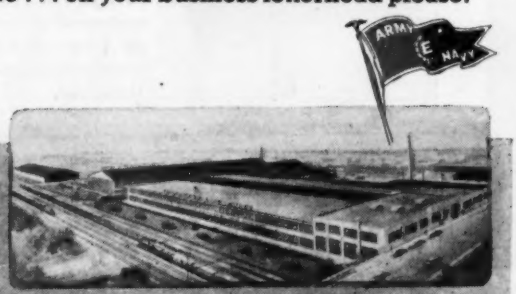

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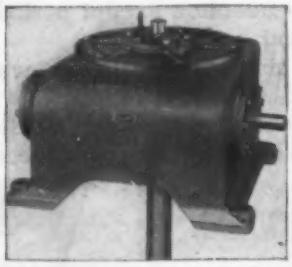

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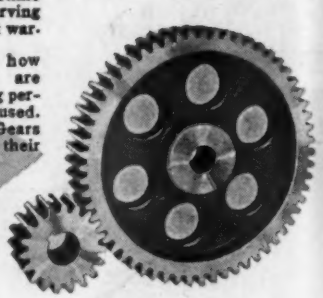

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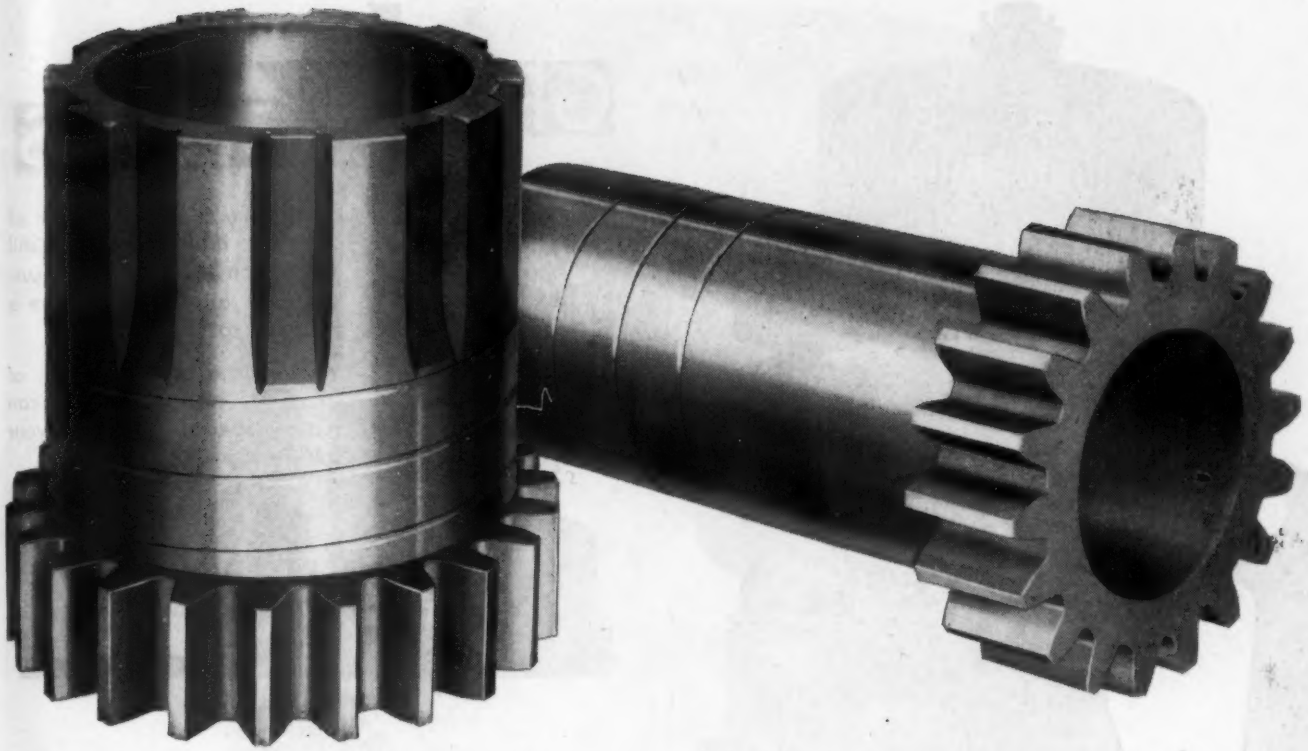

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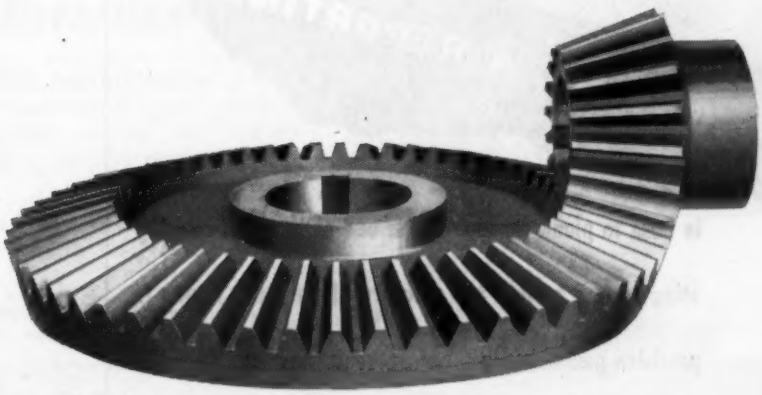

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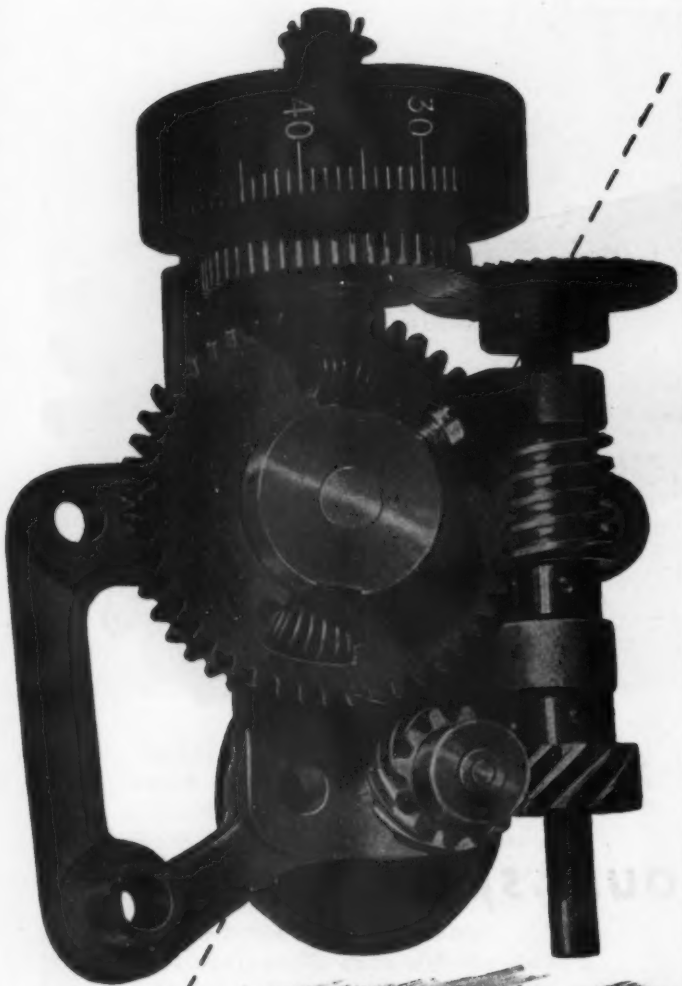

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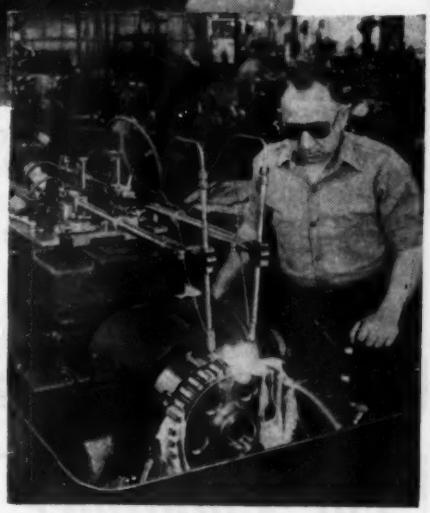

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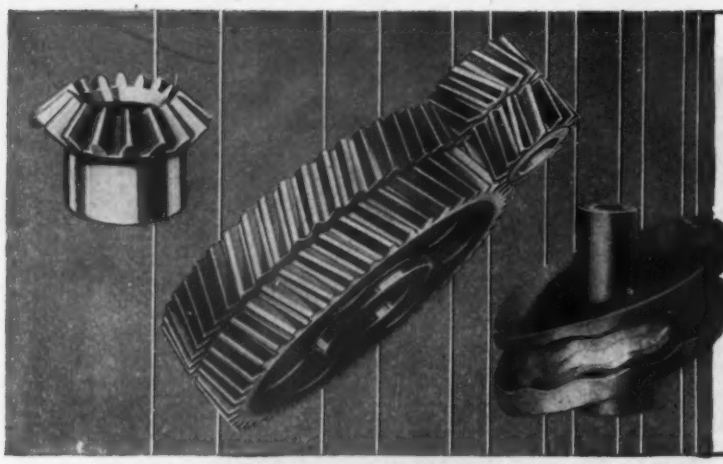

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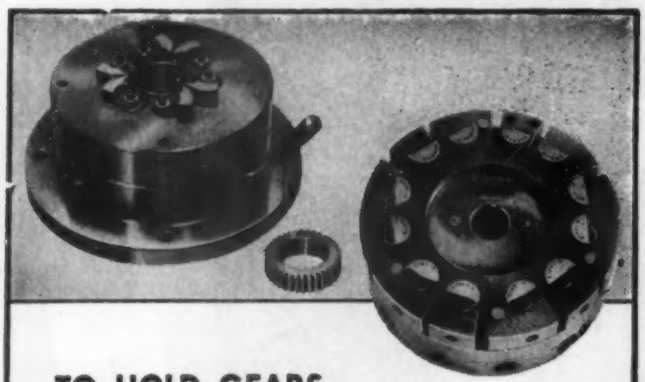

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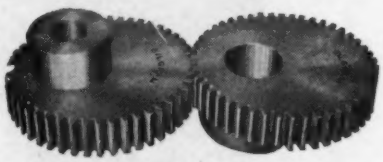

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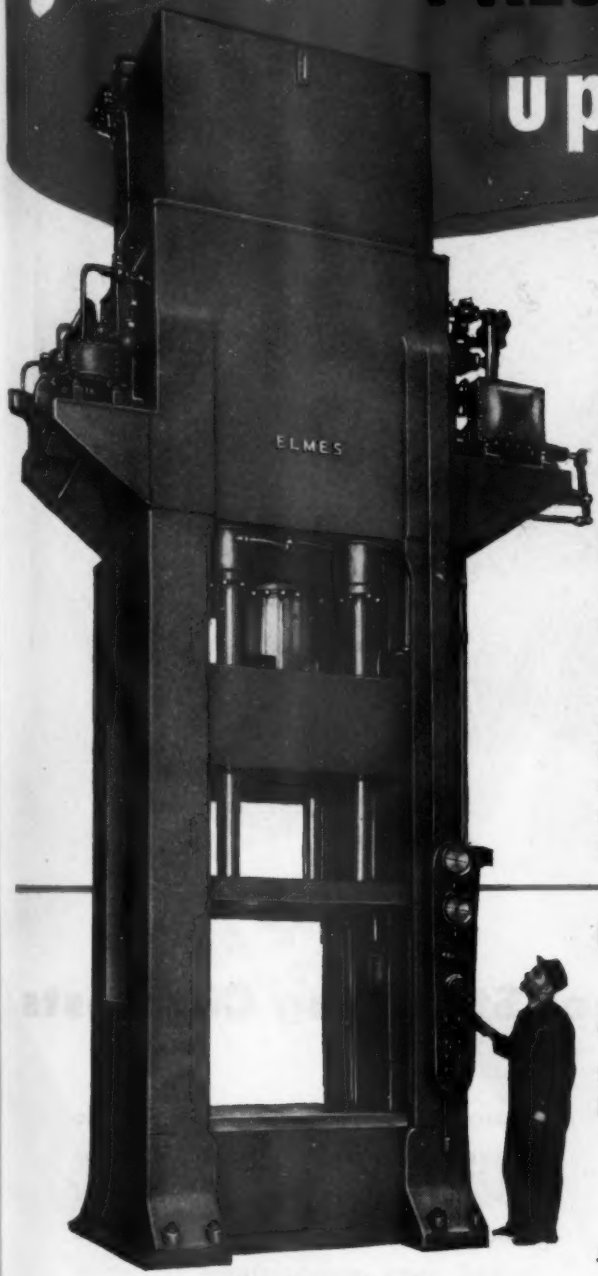

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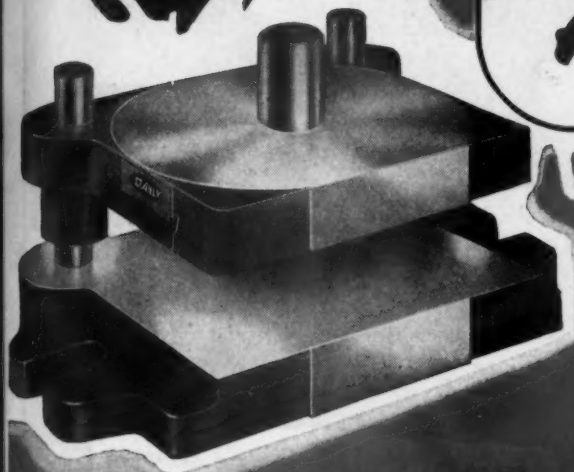

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DUCOMMUN METALS & SUPPLY CO.
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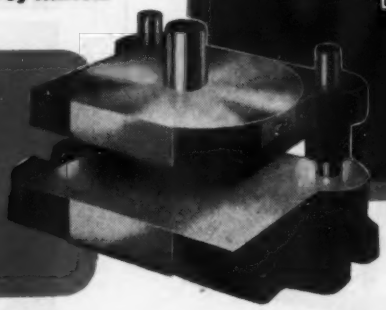
DANLY DIE SETS



DIE MAKERS SUPPLIES • *Welded Steel Fabrication*

● Our large stock of die accessories of all kinds assures prompt shipment.

Dowel pins in 163 standard sizes (plus oversizes) ground to exact diameters, carburized, hardened and tempered to case hardness Rockwell C. 60-62 effective to depth .020" and core hardness Rockwell C. 50-54.

Standard and Special die sets in all sizes.

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CENTERLESS BLADES
BLADES FOR CENTERLESS GRINDERS
. . . TIPPED WITH TUNGSTEN CARBIDE
assure greater production and accuracy in the finish grinding of bullet cores, armor-piercing shot, shells, projectiles, tank parts, aircraft engine parts, rifle and machine gun parts; and a wide variety of screw machine products, shafts, spindles and special shape parts.
Talide-Tipped Tools for all types of turning, boring and facing operations on steels, cast iron and non-ferrous metals and non-metallic materials. Send for catalog No. 43-T.
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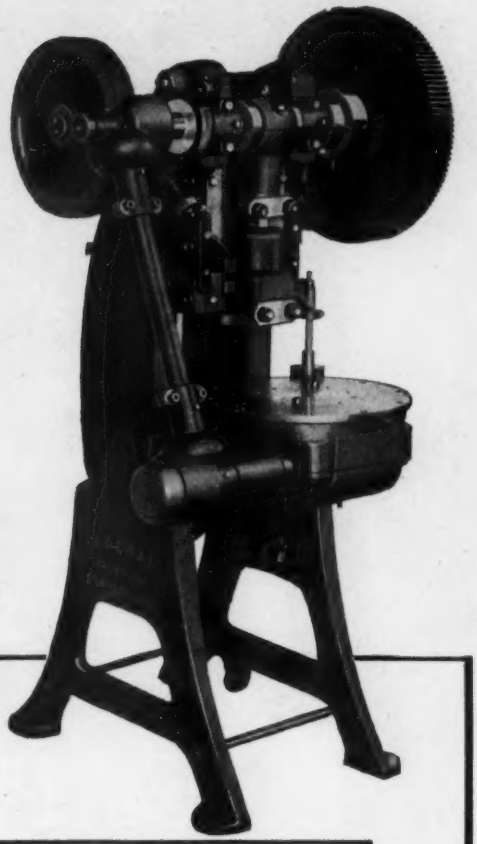

Federal Dial Feed Presses are now being used for hundreds of time-saving, work-saving, money-saving operations in factories throughout the country—for their versatility is limited only by the tooling skill and resourcefulness of the production engineers. Federal Dials are easily indexed to any part of the crankshaft revolution, from 90 to 180 degrees, giving long or short dwell of the dial. Positive-locking mechanism smooths out the dial action, permitting unusually high speeds with exceptional accuracy, and assuring additional safety for the operator. Cannot skip or coast by stations. And on some jobs the dial feeds can be equipped with automatic loading and ejector mechanisms which often increase production speed as much as 4 to 5 times over hand operations. Available in eight sizes. *Write today for new catalog* which illustrates and describes the complete line of Federal Presses.

THE FEDERAL PRESS CO.

105 Division Street, Elkhart, Indiana

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ORDER NOW FOR WAR AND POST-WAR PRODUCTION

Federal Presses will be just as effective in overcoming tomorrow's peace-time production problems as they are in today's war production. It will pay you to order now, for today's needs or prompt post-war delivery.

FOR MANY JOBS

- **Burnishing**
- **Staking**
- **Broaching**
- **Marking**
- **Forming**
- **Assembling**
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Below—Rotary switches are speeded to completion at P. R. Mallory and Co., with help of Federal Dial Feed Presses.

FEDERAL DIAL FEED PRESSES

More production per man hour is being obtained in war plants using Niagara Power Squaring Shears. Convenient operation, quick, accurate setting of ball bearing, self-measuring parallel back gage, full visibility of cutting line, instant-acting Niagara sleeve clutch and complete accessibility at rear are some of their modern features. Built in a complete range of capacities and sizes. Niagara Machine & Tool Works, Buffalo 11, N. Y. District Offices: Detroit, Cleveland, New York.

Shear knives available for cutting alloy and special steels. Let us know what you desire to cut. Prompt delivery on spare knives for Niagara Squaring Shears. Also factory regrinding service by the same skilled men who grind new Niagara knives.

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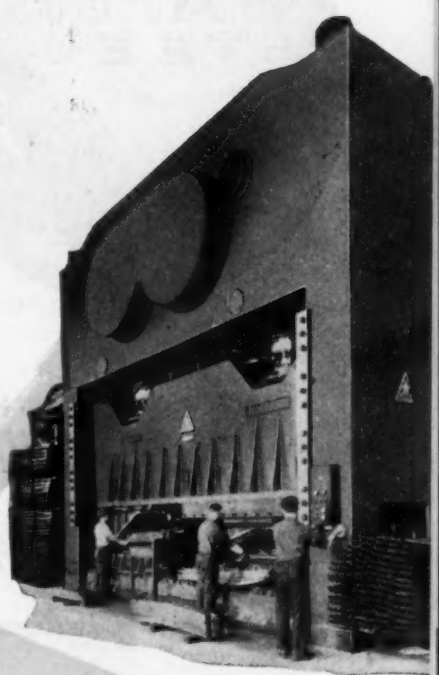
BUY UNITED STATES WAR BONDS AND STAMPS

HE KNEW HOW, BUT NOT WHY

Ages ago, a man sat at the potter's wheel and pondered the mystery before him. At the touch of his hands the yielding clay took graceful, symmetric form. The mystery, of course, was the circle . . . that geometrically precise figure that lies in one plane, with all points of its circumference equidistant from its center.

If the mystery of the circle had never been solved, if man had never learned the rules of mathematics that must guide his design, we might still be pondering at the potter's wheel.

Today, with knowledge and initiative, men have gained amazing successes in countless fields of endeavor. In our field, for example, Clearing has combined sound engineering and initiative to produce outstanding presses of every type and capacity. If you have a problem in production where a press can or might do the job, we invite you to call on Clearing. Clearing Machine Corporation, 6499 West 65th Street, Chicago 38, Illinois.



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MECHANICAL AND HYDRAULIC PRESSES

for such operations as

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"DIE-LESS" DUPLICATING SAVES MAN HOURS and DELAYS

DIE ACCURACY WITHOUT DIES

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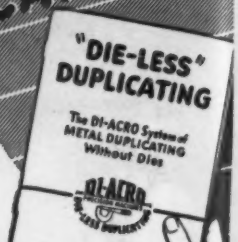

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O'NEIL-IRWIN MFG. CO. 311 EIGHTH AVE. SO., MINNEAPOLIS 15, MINN.

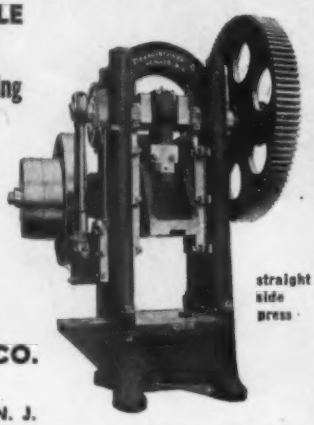
STRAIGHT SIDE SINGLE CRANK PRESSES

for heavy blanking and forming

Heavier classes of blanking and forming work can be handled efficiently and economically on these presses.

Sturdily constructed with either solid frame or built up with tie rods. Small elastic deflections do not affect tool alignment. All stresses taken centrally. Made also with wedge adjustment for slide for very close work.

Full details on request.



ZEH & HAHNEMANN CO.

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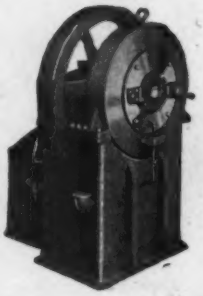

THE TORRINGTON ROTARY SWAGING MACHINE

— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

The Torrington Co., Swager Dept.

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AUTOMATIC EQUIPMENT
THE V & O Press Co.
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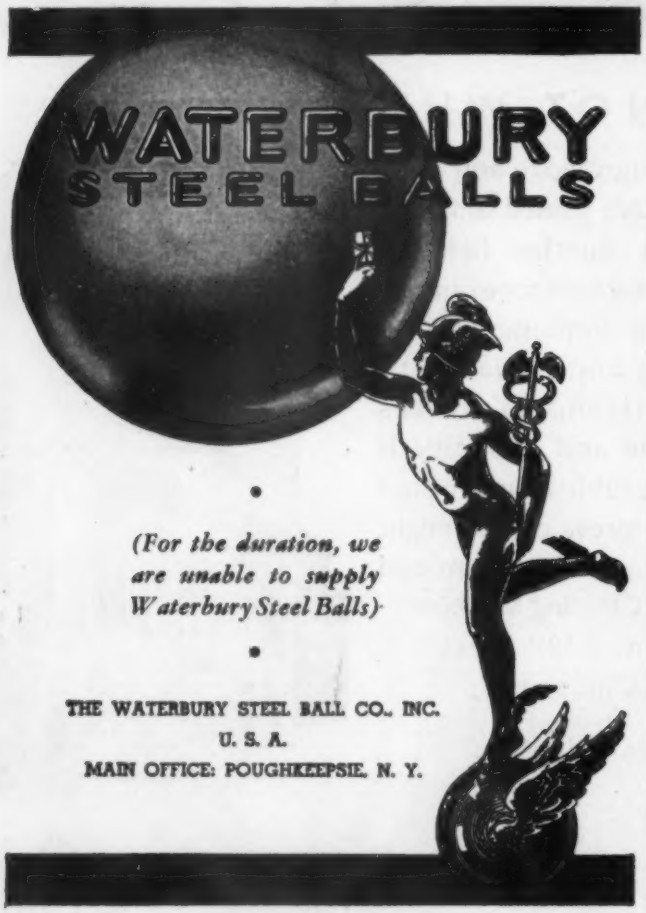

(For the duration, we are unable to supply Waterbury Steel Balls)

THE WATERBURY STEEL BALL CO., INC.

U. S. A.

MAIN OFFICE: POUGHKEEPSIE, N. Y.

BETTER-MADE

DIE SETS

AT LOWER COST

46 Styles—195,000 Sizes

E. A. BAUMBACH MFG. CO.

Machined Steel Semi-Steel

Send for our new catalog

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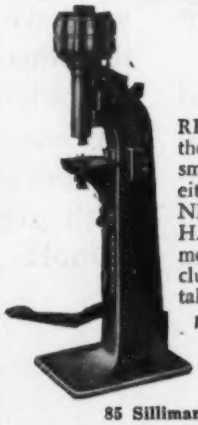

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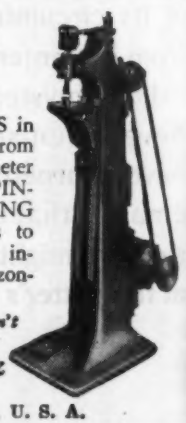
RIVETERS — PIONEERS in their line—head rivets from smallest to 5/8" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.



THE GRANT MFG. & MACHINE CO.

85 Silliman Ave., Bridgeport, Conn., U. S. A.

150 H
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Hundreds of smooth-operating Steelwelds are now in service performing a host of varied punching, bending and forming jobs. A complete line of machines is available for plate of all thicknesses to one inch or lengths to 20 feet.

Punching 150 holes ranging from .078 inch to .250 inch in size at one time, is a job easily done on Cleveland Steelwelds.

Clearance between punch and die illustrated, was held to .0015 inch to avoid burrs. The punches are individually gagged and gauged, with built-in strippers, set to accurate scale readings and as close as ¾-inch centers.

For supporting the sheets during punching, this machine is provided with a special table and micrometer gauge which is operated by a handle at front of press just below top of bed.

GET THIS BOOK!
CATALOG No. 2002 gives complete construction and engineering details. Profusely illustrated

THE CLEVELAND CRANE & ENGINEERING CO.
1127 EAST 283RD ST. WICKLIFFE. OHIO.

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Every man in your shop and other shops will find this practical Handbook of 1638 pages as useful as any tool in his kit.

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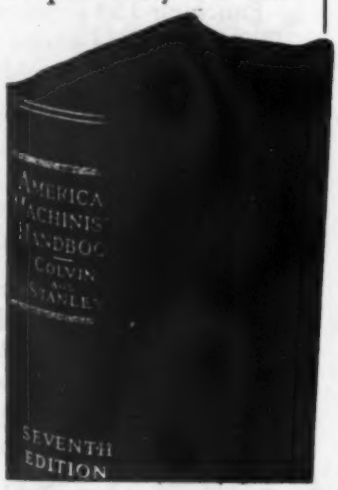

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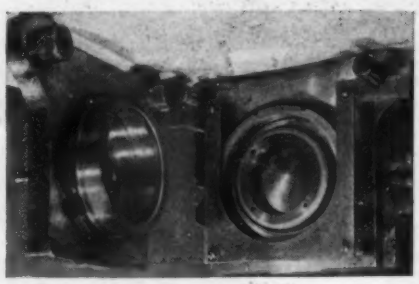
Make Dies of Tool Steel TUBING

and *Save*

1. Time
2. Money
3. Manpower
4. Metal



THIS DIE IS MADE OF 4 TOOL STEEL TUBES

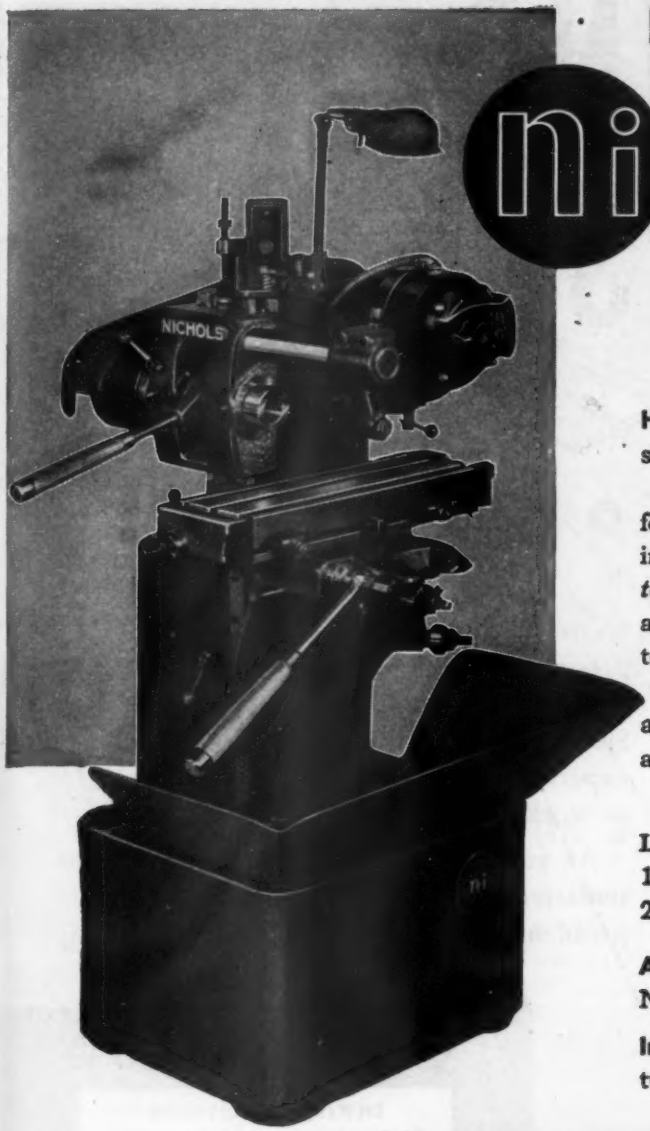
The blanking and drawing die shown above was made of BISCO tool steel tubing at a fraction of the cost of forging rings or boring solid bars. When you bore tool steel bars to make dies or machine parts, you are simply manufacturing turnings. You are wasting steel, money, time and labor, all of which can be saved by the proper use of BISCO tool steel tubing. Why not let us give you more information on this subject?

Send Today For This Folder ➡

BISCO

THE BISSETT STEEL CO.

945 EAST 67th ST., CLEVELAND 8, OHIO



HERE'S THE

New Model Nichols Miller

Here's the New Model of one of the most versatile precision milling machines on the market.

Besides conventional milling, the Nichols Miller performs dozens of unusual operations—such as profiling, boring, facing, diamond wheel-grinding—*to tolerances in tenths.* Rise-and-fall spindle arrangement and a full line of attachments make the Nichols especially valuable for the toolroom or laboratory.

Worth remembering: Several thousand of these millers are in operation the world over—and we've never required a full-time service man!

WORKING SURFACE: 6¾" x 21", or 6¾" x 30". RANGE: Longitudinal, 10" or 19"; Transverse, 7"; Vertical-Knee, 13½"; Spindle Rise and Fall, 4½". STANDARD SPEEDS: to 2400 RPM. SPECIAL SPEEDS: to 5000 RPM.

Also Available—Nichols Millers for special requirements. Nichols Double-Spindle Millers for high-production needs.

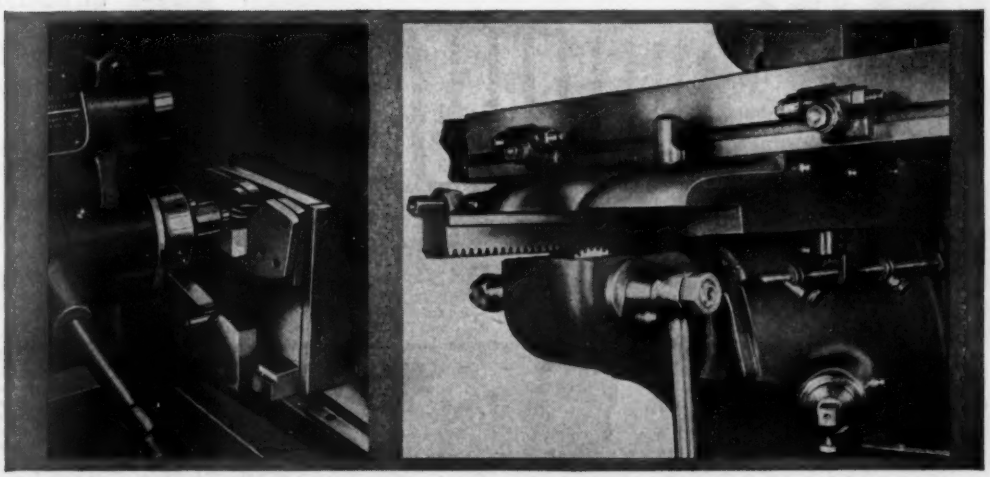
Immediate Deliveries—Send today for descriptive literature and free 86-page Handbook of unusual applications.

EXAMPLES OF NICHOLS VERSATILITY

(Left to right)

PROFILE MILLING, using template and follower, with remarkable ease of control, work-piece under full view.

RACK AND PINION TRANSVERSE FEED, available in place of standard feed screw for rapid motion on drilling, end-milling and boring operations.



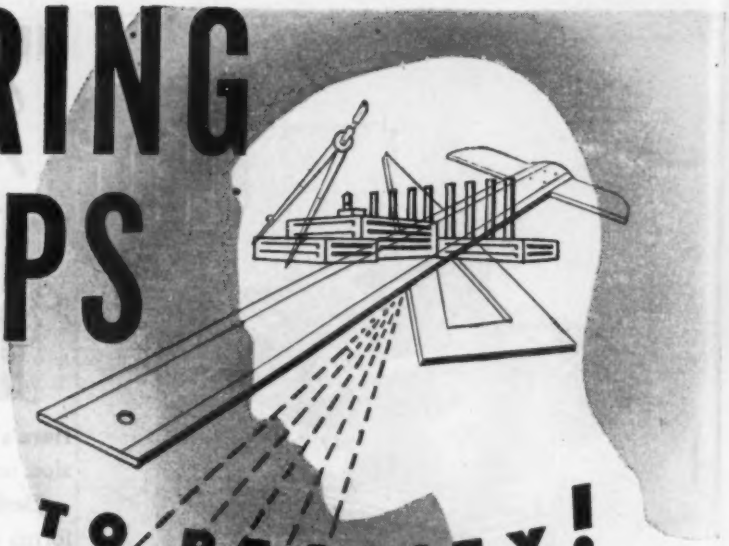
Manufactured by W. H. NICHOLS & SONS, Waltham, Mass.

SOLE DISTRIBUTORS

NICHOLS-MORRIS CORPORATION

50 CHURCH STREET, NEW YORK 7, N. Y.

ENGINEERING ALL STEPS



from IDEA TO REALITY!

● Stepping in at any point from idea to finished product, Siewek Engineering Division is both qualified and equipped to carry on for you.

Manufacturers, thinking now in terms of better post-war products, are turning to Siewek for practical development, easing the strain on their own busy engineering staffs. Whether you want to develop the idea and the product, or design and build special machines and tools to manufacture it, Siewek's highly skilled engineers and experienced tool designers are ready to work with you.

At your request, a Siewek representative will stop in and discuss your problems with you.

SIEWEK TOOL DIVISION
OF DOMESTIC INDUSTRIES, INC.

Manufacturers of—

SIEWEK CLAMPS

SIEWEK
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SIEWEK "PROGRESSIVE"
SHEAR-CUT
END MILLS

SIEWEK

Designers and Builders of Tools, Dies, Jigs, Fixtures and Special Machines

ENGINEERING DIVISION
OF DOMESTIC INDUSTRIES, INC.
Chicago—510 N. Dearborn St.
Detroit—2011 Park Avenue
Hartford, Conn.—209 Pearl St.
Springfield, Mass.—11 Stearns Sq.

From Golf Pro to Screw Machine Operator

Above—Barney Barenbrugge, Golf "Pro", operating Greenlee Six. View shows tapping attachment in No. 3 position which permits dual production on parts below.

Prod. Time—11 Sec. for Two. Size: 1⅜" O.D. x 3/16". Mat.—Aluminum.
Prod. Time — 7 Sec. for Two. Size: 1⅜" O.D. x 3/16". Mat.—Aluminum.
Prod. Time—7 Sec. for Two. Size: 1⅜" O. D. x 1/16". Mat.—Aluminum.

These three aluminum couplings, vital in aircraft use, re produced on a 1¾" capacity Greenlee Six. The machine is tooled with a dual set-up . . . two parts are produced simultaneously.

The following tooling set-up, used by Chicago Metal Hose Corp. to produce couplings, illustrates the easy application of tools on a Greenlee Six.

SEQUENCE OF OPERATIONS

1st Position
Form two pieces. Drill small hole for two pieces.

2nd Position
Knurl two pieces. Tap drill 1st piece.

3rd Position
Tap 1st piece. Cut off 1st piece.

4th Position
Tap drill 2nd piece.

5th Position
Tap 2nd piece.

6th Position
Cut off 2nd piece.

Machine equipped with lead screw for precision threading and tapping. Large part run at 900 R P M; small parts 1100-1300 R P M.

NOTE: Free reprints of this ad are available to companies wishing them for labor recruitment, etc.

ON A GREENLEE 6-SPINDLE AUTOMATIC

★ For thirteen years, Barney Barenbrugge, professional, plied his woods and irons over the fairways to master the game called golf. But, today, like other Americans, he's busy with another profession — helping Uncle Sam win a war!

Fifteen months ago, he was assigned to the job of running Greenlee 6-Spindle Automatics in the plant of Chicago Metal Hose Corporation. He'd had no previous machine experience. Before Pearl Harbor he had never worked in a shop.

But, with thoroughness, he applied himself to this new study of angles, timing and rhythm. He learned rapidly — found his new job interesting. Step by step he studied the fundamentals. Soon, he was able to make tooling changes and precision adjustments, quickly and easily. Today, he operates a Greenlee with the proficiency of a production professional.

Today, with a trade as well as a profession, he aids his Company and his Country to "back the attack." He is producing, on the Greenlee, thousands of precision parts that are machined right to reach the fight. Three of these parts, each produced *two at a time* on a dual set-up, are shown above.

For detailed facts on features of Greenlee 6, write

GREENLEE BROS. & CO.
1731 MASON AVE., ROCKFORD, ILLINOIS

GREENLEE

MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES

WITH *MOTCH & MERRYWEATHER*

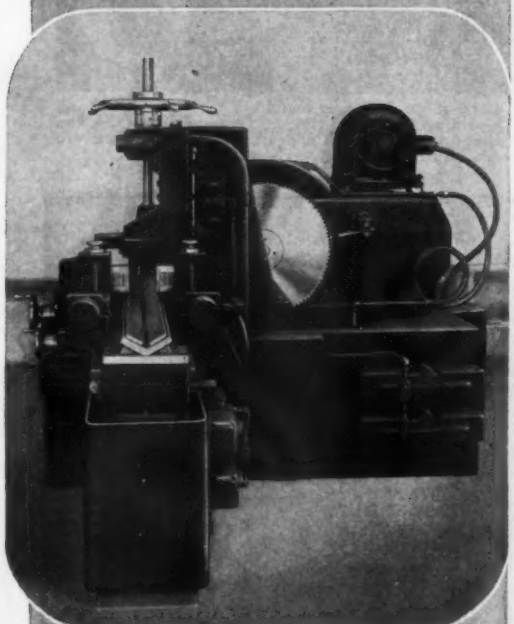
Automatic

COLD SAWING MACHINES

WARTIME demands foreshadow the requirements of a peacetime economy. Then, as now, quality, speed and cost will be paramount in every line of manufacture.

The development by Motch & Merryweather of an entirely automatic cold sawing machine is the result of many years' intensive engineering in the field of sawing metals. We offer you a complete guide to your sawing needs, whether for the machine itself, for saw blades or blade-sharpening equipment. *Only Motch & Merryweather builds all 3.*

THE MOTCH & MERRYWEATHER MACHINERY COMPANY
Penton Building · CLEVELAND 13, OHIO

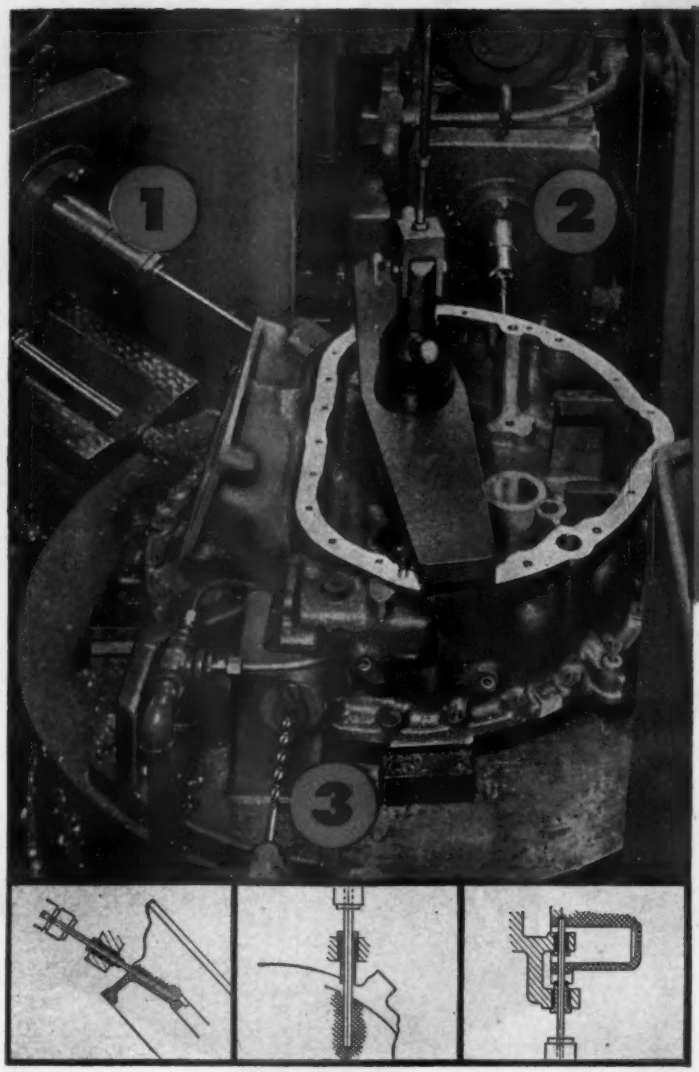


The Motch & Merryweather Automatic Cold Saw attains efficiencies much higher than manual methods since it removes the element of human fatigue.

Built by **MOTCH & MERRYWEATHER**

MOTCH AND MERRYWEATHER THE MACHINERY CO
CLEVELAND CINCINNATI DETROIT PITTSBURGH

Miscellaneous Holes Drilled 8 Times Faster with W. F. & JOHN BARNES UNIT TYPE MACHINES



1 Drill 5/16" hole 3-1/16" deep

2 Drill 27/64" hole 2-9/16" deep

3 Drill Through 2 walls with 21/64" drill

TOOLING AND OPERATIONS

Unit 1 — 5/16" drill.
Unit 2 — 27/64" drill.
Unit 3 — 21/64" drill.

Units 1 and 2 — Provided with step-drilling attachment.

Units 1 and 2 provided with coolant manifolds (not shown) when rifle drilling these holes.

Diameters — .003" — .004".
Locations —. 010".
Previous Drilling Time — 10.65 Min.
Present Drilling Time — 1.30 Min.
SAVINGS — 9.35 Min.

Illustrated at the left is a W. F. and John Barnes 3-way 3-spindle Unit-Type Machine for machining airplane engine intermediate rear crankcase. Tooling for this job is illustrated above.

Drilling Time Reduced from 10.65 to 1.30 Minutes per Crankcase

Doing the same job in one-eighth the former time . . . that's the production rate set by a W. F. and John Barnes unit type 3-spindle three unit machine in the plant of this large aircraft engine manufacturer. Actual time saved per crankcase in performing this 3 hole drilling operation was 9.35 minutes. Two machines were formerly required to do the job. By being able to perform the same operations on a single unit type machine, valuable man hours are saved and floor space conserved.

Unit Machines are Designed to Perform a Number of Operations

Performance stories of this kind are being continually submitted by users of W. F. and John Barnes unit type machines. Their versatility makes them highly adaptable to many types of machining operations. They are constructed from standard hydraulic feed and drive units which are easily rearranged to accommodate changes in part design. Where operations are required on a number of different parts quick-change heads can be provided. The general design of unit machines readily lends itself to a rapid conversion from war to peace-time production.

Submit Your Production Problems to our Engineers

The next time you are confronted with a production problem submit it to our engineers. They will make a complete analysis of it and suggest a machine to solve it. Their advice, based on years of experience in the design and construction of special machine tools, will result in greater production economy. This service is offered to you without cost or obligation.

FREE Useful Machining Information will be sent upon request.

5 booklets on W. F. and John Barnes machines and their applications. Write for Bulletins Number 544A.

8 booklets showing typical tooling applications and problem solutions. Write for Bulletins Number 544B.

W. F. and JOHN BARNES

310 SOUTH WATER STREET • ROCKFORD, ILLINOIS, U.S.A.

a Suggestion TO OWNERS OF

Bodine MACHINES

. . . for training your *New* Essential Workers . . . . . *Easier and Faster*

Production requirements in this critical war year are shifting men from non essential to essential work. Most of them are not mechanically minded.

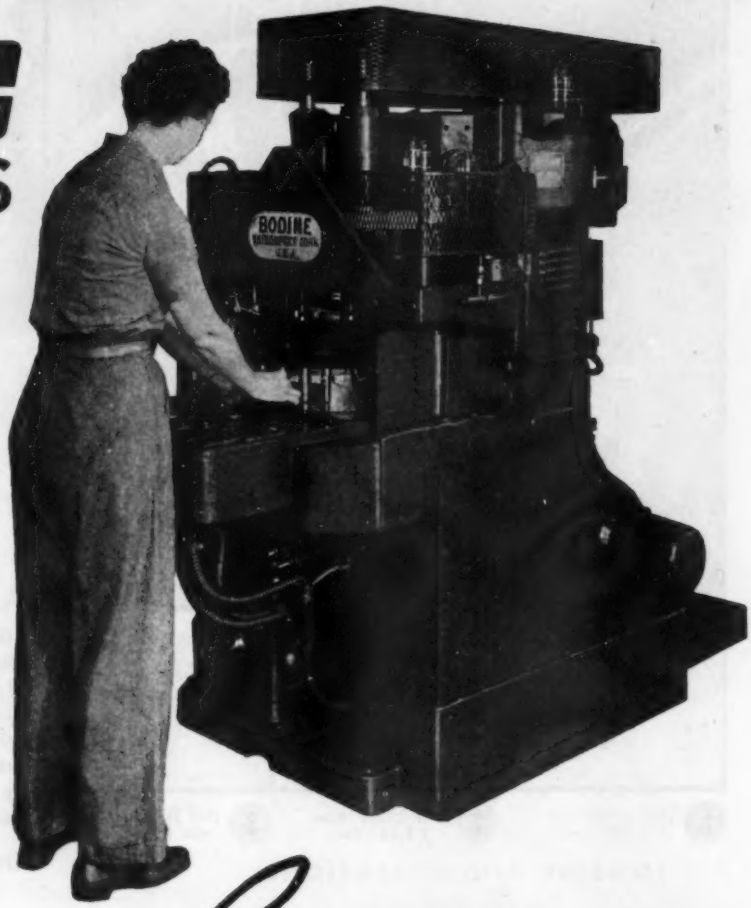
It is the responsibility of war plants to make them productive employees as quickly as possible . . . so we suggest that you train them to operate Bodine machines.

Here are sound reasons for such action:

1. Bodine automatic operation can now be taught in weeks instead of months.
2. Men and women of fair intelligence have quickly reached high production rates of accurately made small parts.
3. Damage to machines, tools and the work is prevented by automatic protective devices . . . which also protect the operator.
4. Operating Bodine machines is clean, healthy work . . . at low fatigue factor . . . a major contribution to the defeat of absenteeism.
5. Bodine operators clearly see how well they fit into war work . . . are contented with their effort to help win the victory.

This procedure may permit advancement of your older experienced operators to more difficult jobs...for improved all-around production.

Please feel free to ask advice from Bodine Engineers on new setups or changeovers of your machines for new or added duties.



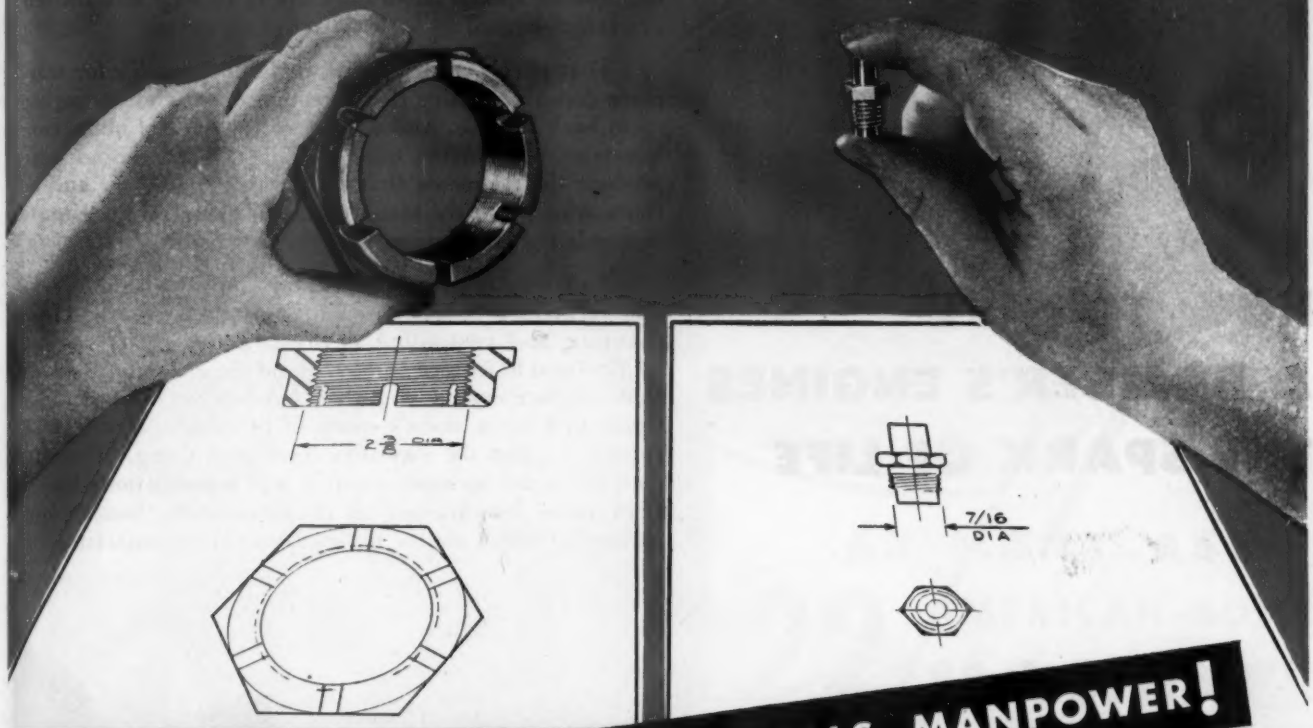
DRILLING, MILLING, TAPPING, SCREW INSERTING *Simultaneously*

BODINE does this:

- Builds 6 standard models and develops the particular tooling for the work to be done.
- Permits Milling, Drilling, Tapping, Screw Inserting, one or all operations, during one cycle of the dial . . . with manual or hopper feed . . . manual or automatic ejection, depending upon the nature of the part processed.
- Allows for the greatest flexibility in tooling set-ups for an extremely wide range of work.
- Electrically protects machine, tools and work from damage . . . insures safety to operator.
- Provides a compact design in all machines, which cuts floor space requirements to 54" x 60" for the smaller . . . 90" x 96" for the largest size.

THE **Bodine** CORPORATION
BRIDGEPORT CONNECTICUT
AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING AND SCREW INSERTING MACHINES

Let PLAN-O-MILL do it...



. . . and SAVE MONEY, MATERIALS, MANPOWER!

Put Plan-O-Mill to work for you. Replace obsolete, wasteful machines now. The two parts pictured above are now being threaded on the same machine with only a slight tooling change!

Plan-O-Mill does a *better* job of form and thread milling—does it with exceptional speed, accuracy and finish! Consider these outstanding advantages:

***Versatile,* handles a wide variety of form and thread milling jobs.**

***Easy to operate,* one operator can handle two or more machines.**

***Semi-automatic,* provides separate and complete control of feed-in and feed-around.**

***Economical,* the part does not revolve, requires relatively small, solid, low cost cutters.**

Find out about Plan-O-Mill today. Contact your machinery dealer or write direct.

THREAD AND FORM PLAN-O-MILL MILLING MACHINES

PLAN-O-MILL CORPORATION

1511 E. EIGHT MILE ROAD • HAZEL PARK, MICHIGAN

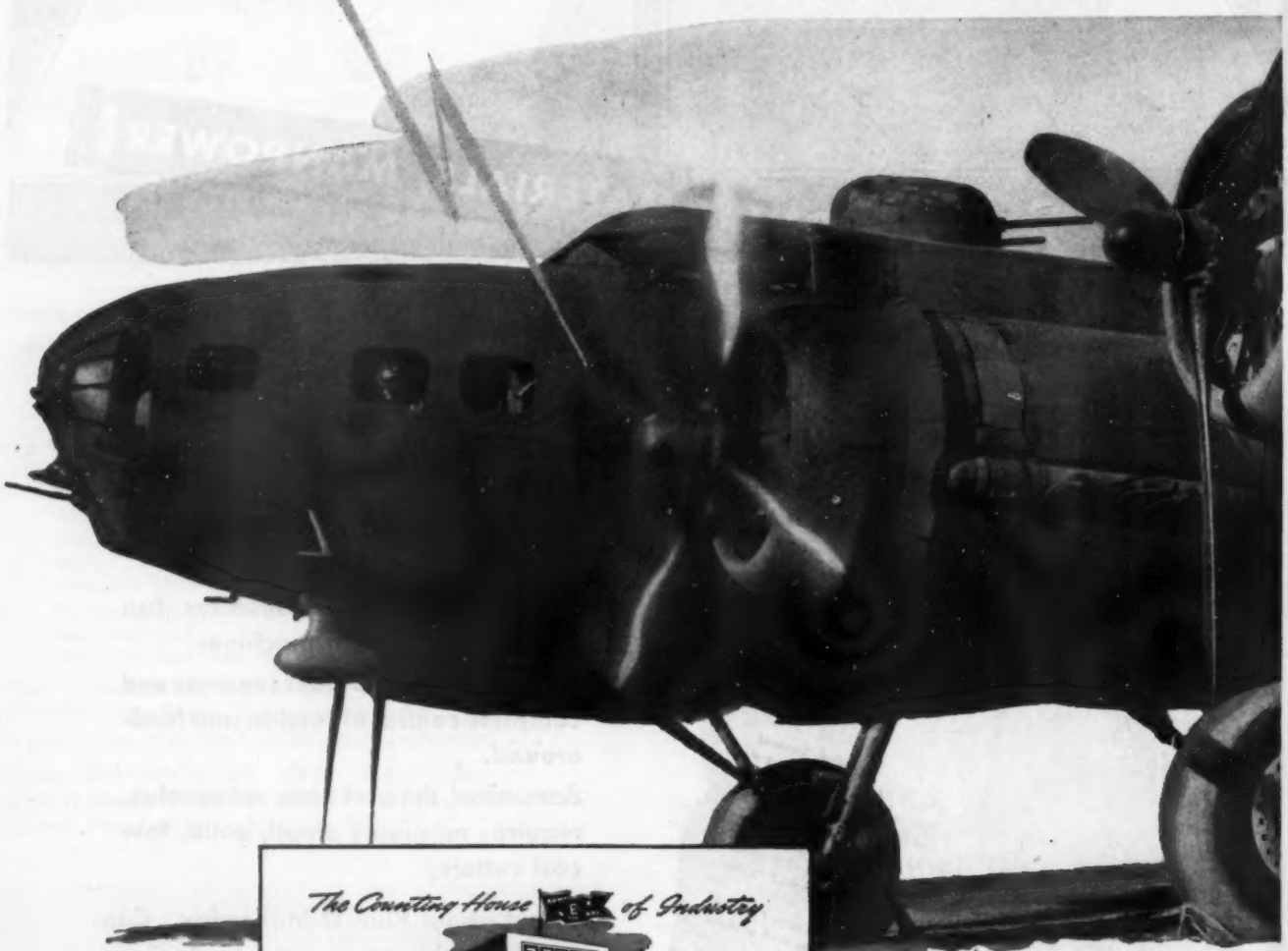
THREAD AND FORM PLAN-CO MILLING CUTTERS

HOW TO GIVE A BOMBER'S ENGINES THE SPARK OF LIFE

"Start Number One!" . . . and an unfailing electric whip lashes thousands of sleeping horses to a thundering roar of readiness. Then three more flicks of the lash, and the bomber sprints down the runway to leap into the air . . . target-bound.

That purple ignition spark is the *spark of life* for warplane crews . . . lifting them, keeping them aloft, bringing them back to base. And a sense of this mortal obligation is carried deep in the minds of all at Veeder-Root who produce the magnetos that supply this spark . . . and of those who patiently test them far beyond the ultimate demands that will be imposed.

And why is part of the nation's vital magneto production given to men and women who have previously made counting and computing devices? Because *this responsibility must be in good hands, beyond the shadow of a doubt.* Pilots, crew members, and their families *can count on these hands* to keep a plane's spark of life ready, strong, and steady . . . just the way they have been doing, all along. And there are no more capable and conscientious hands than those long-trained in mathematically honest mechanics — which are the basis of counter-manufacture.



The Counting House of Industry

77204

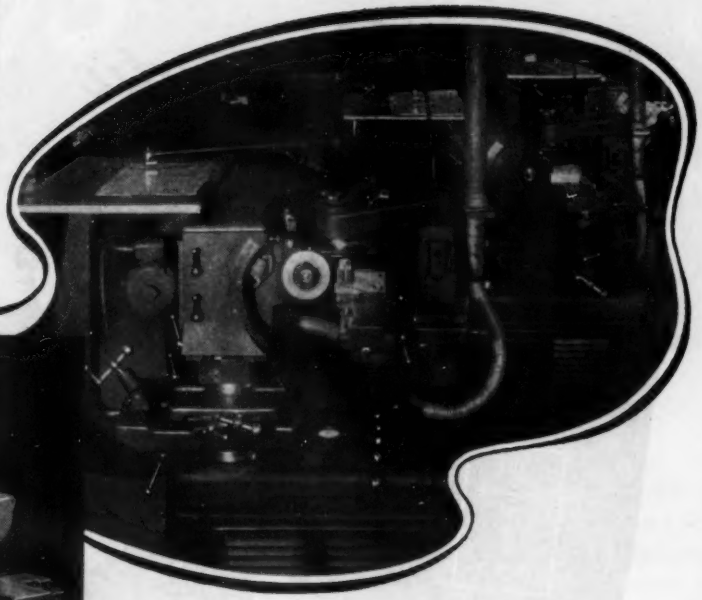
VEEDER-ROOT

INCORPORATED

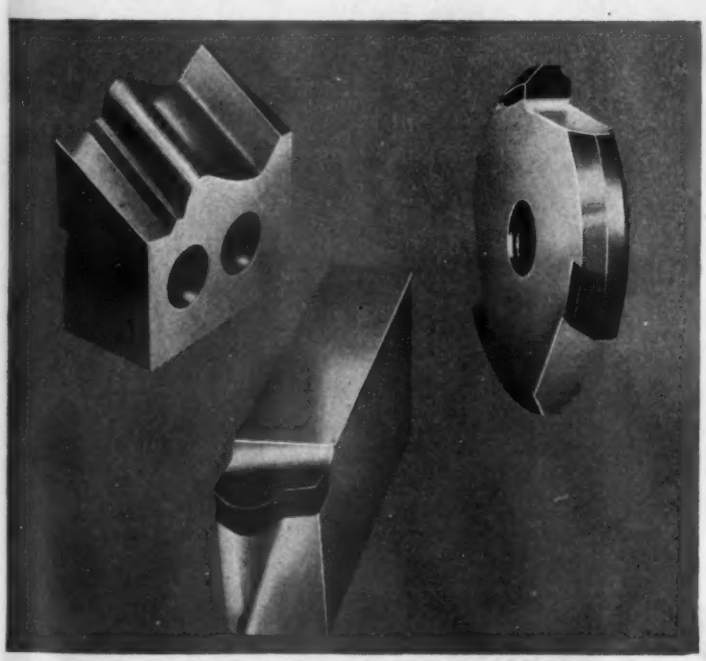
Hartford 2, Connecticut, U. S. A.

In Canada: Veeder-Root of Canada, Ltd., Montreal
In England: Veeder-Root Ltd. (new address on request)

Batteries of Wickman PRECISION PROFILE GRINDERS



Shown above is the Wickman Profile Grinder on which is mounted the circular grinding attachment supplied as an extra for use on cylindrical work such as circular form tools.



AS MANY AS 22 AMERICAN-BUILT MACHINES NOW OPERATING IN ONE PLANT

A true measure of the value of any machine tool can be found in the records of "repeat" orders. The Wickman Corporation customer list now shows a number of concerns who bought one Wickman Profile Grinder . . . and then placed orders for as many of these machines as were required to handle in their production all of the contour grinding work for which the Wickman machine is particularly suited. Every user has realized definite savings in both machining time and skilled manpower.

Shown at the left are three typical examples of work ground and inspected on the machine without use of radius dresser or formed wheel. While especially adaptable to cemented-carbide work, the grinding of contours in high speed steel as illustrated in the upper left is handled equally as efficiently.

FULL INFORMATION IS YOURS FOR THE ASKING

BUY WAR BONDS

THE Wickman CORPORATION

15539 WOODROW WILSON AVE.
DETROIT 3, MICHIGAN

Avey Automatic
METHOD No. 1

THE Avey CAM FEED UNIT

No. 1 Size—½" capacity in cast iron.
No. 2 Size—⅞" capacity in cast iron.

designed for simple automatic indexing when duplication of operation on any number of faces of work is required

THE AVEY DRILLING MACHINE CO.
CINCINNATI • OHIO • U. S. A.

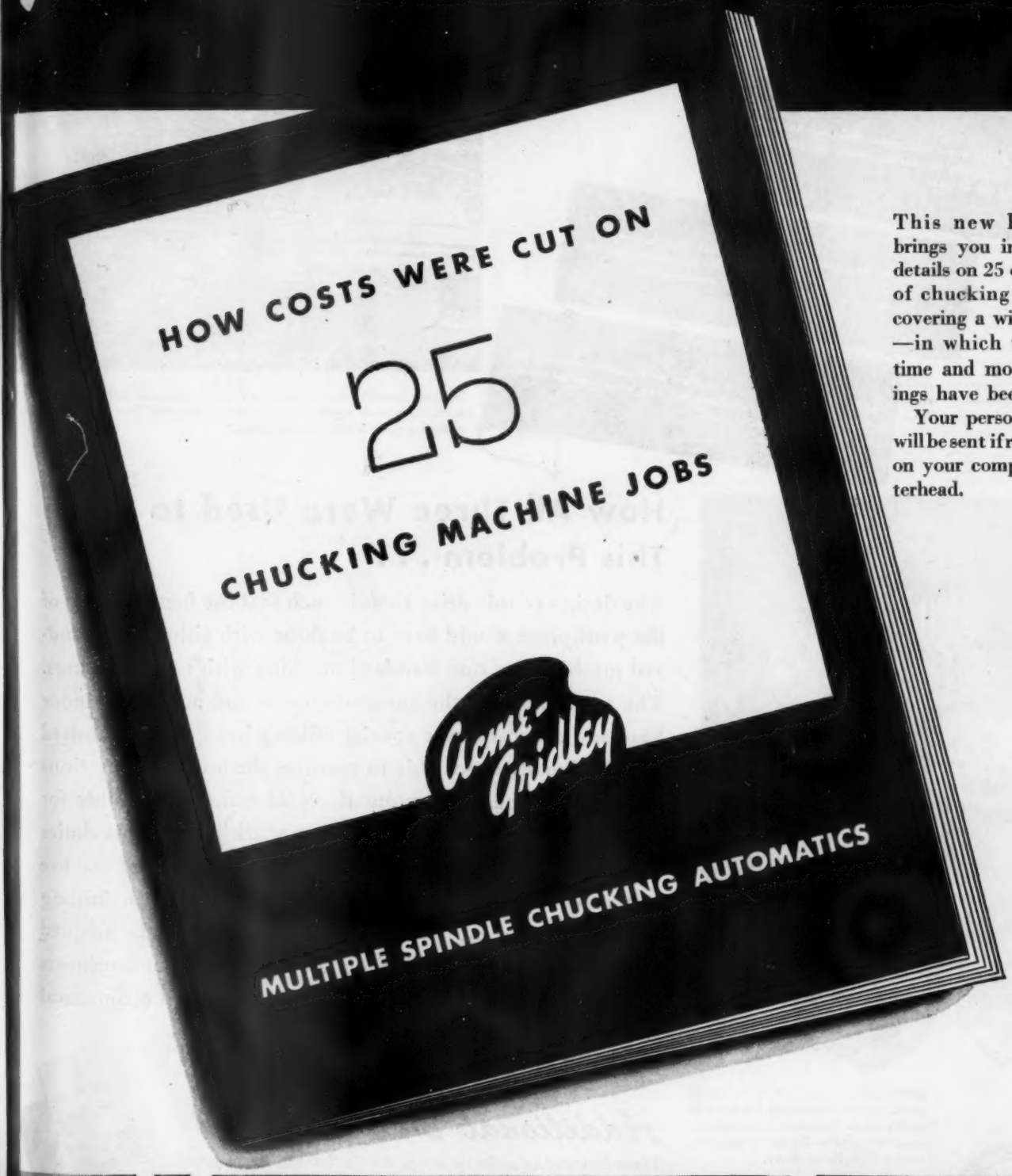
The AVEY Cam Feed Unit (Avey Automatic Method No. 1)—a low capital investment. It decreases the cost per piece in production. This is accomplished by Speeding Production—Less Operator Fatigue—the enabling of semi-skilled operators to deliver High Quality Production: Speedily, Accurately, Efficiently, and with a minimum of supervision.

ARMY E NAVY

Avey DRILLING MACHINES

New Facts

ON CHUCKING MACHINE WORK



This new booklet brings you important details on 25 examples of chucking work—covering a wide range—in which unusual time and money savings have been made.

Your personal copy will be sent if requested on your company letterhead.

THE NATIONAL ACME CO.

170 EAST 131ST STREET • CLEVELAND, OHIO

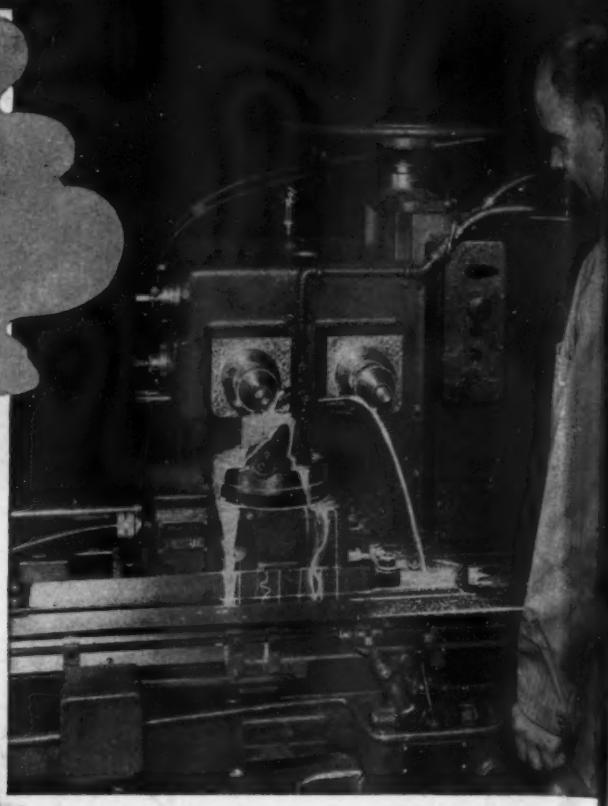
ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS • THE CHRONOLOG • LIMIT AND CONTROL STATION SWITCHES • SOLENOIDS • CENTRIFUGES • CONTRACT MANUFACTURING

Here's what can be done with Standard Rigidmils
...to Solve Special Milling Problems

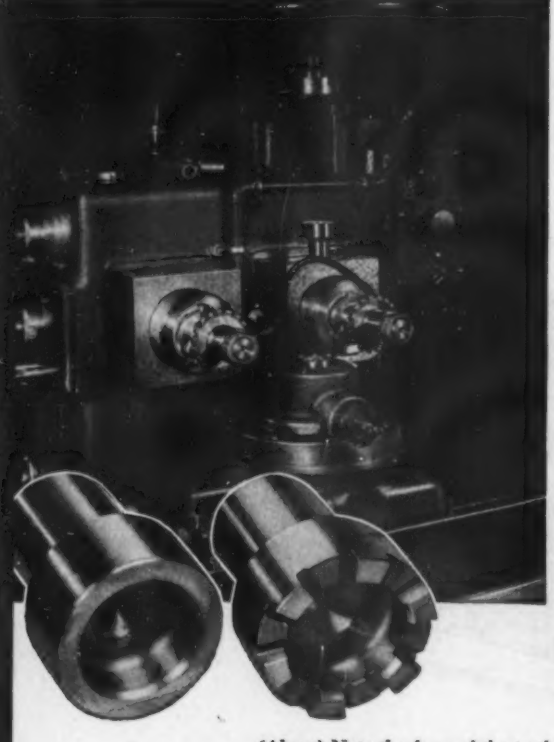
AUTOMATIC CYCLES in various combinations can be provided on Sundstrand Rigidmils by merely setting the dogs on the table to suit the job at hand.

STANDARD AUTOMATIC INDEX BASES manufactured by Sundstrand can be applied to Rigidmils for operations requiring rotary indexing in either horizontal or vertical planes.

SPECIAL HEADS can be supplied on Rigidmils because the standard head is a self-contained unit which can be easily replaced with a special head.



(Above) Loading and unloading of each part and starting each cycle is the only work required of the operator. The table and indexing cycle is entirely automatic.



(Below) Close-up of tool arrangement showing Sundstrand Automatic Index Base and Special Two-Spindle Milling Head.

(Above) Note the form of the teeth on this clutch drive shaft. Each tooth undercut on both sides requiring two cuts, one with a left hand and one with a right hand cutter.

How All Three Were Used to Solve This Problem . . .

The design of this drive shaft is such that the form milling of the workpiece would have to be done with either two standard machines or one standard machine with two handlings. The application of the automatic cycle and automatic index base and a two-spindle special milling head to the standard Rigidmil made it possible to perform the milling operations on one machine. The automatic cycle makes it possible for the operator to inspect or do other work because his duties at the machine require only one-half minute out of the five and three-quarters total minutes required in form milling the clutch teeth. Perhaps standard Rigidmils can be adapted to your special milling production problems. Our engineers will be glad to assist you in determining the most economical and productive milling method for your work. Call on them without obligation.

Additional Data...

These interesting bulletins cover the Sundstrand No. 1 Rigidmil and the Automatic Index Base. Get the complete information on this versatile line of milling machines. Write for Bulletin No. 124.

SUNDSTRAND MACHINE TOOL CO. ROCKFORD ILLINOIS U.S.A.

ARMY NAVY

SUNDSTRAND MACHINE TOOL CO.

Rigidmils • Fluid-Screw Rigidmils • Automatic Lathes • Hydraulic Equipment • Drilling and Centering Machines • Special Milling and Turning Machines

2533 ELEVENTH ST., ROCKFORD, ILLINOIS, U. S. A.

Construction Features that Contribute to...

★ VERSATILITY
★ SPEED
★ ABILITY
★ ACCURACY
★ RIGIDITY
★ ACCESSIBILITY and LOW COST
★ PERFORMANCE

POSITIVE CONTROL: Multiple dry disc clutch and leather faced brake in main spindle drive gives operator positive control with flexibility to allow "inching" spindle.

16 SPINDLE FEEDS: Gears of alloy steel, heat treated, finish machined and shaved, mounted on short, ground shafts and ball bearings, provide sixteen spindle speeds, in either direction.

SMOOTH SPINDLE DRIVE: Hardened, ground, and lapped spiral-bevel gears, ball bearing mounted, make sure a smooth spindle drive.

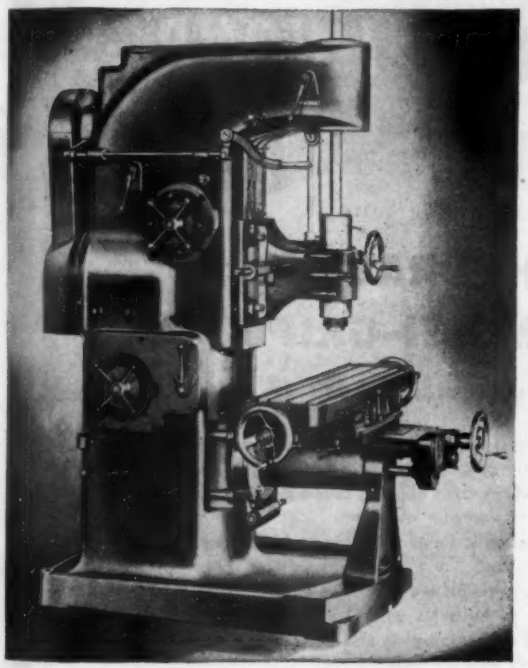
BORING RANGE: Four vertical spindle feeds for boring range from .002" to .010" per revolution.

SPINDLE HEAD SECURELY LOCKED: Positive, quick acting spindle head clamp controlled by a single lever, securely locks spindle head in any position on accurately fitted slide on face of column.

MAIN SHAFT: Single, constant speed motor drives main shaft through multiple V-belts. Compact and accessible. Motor and drive entirely enclosed for safety and cleanliness. Guard easily removed for servicing or adjustment.

TABLE UNIT: A post, accurately ground and rigidly fitted into the column, forms the bearing on which the table unit swivels around the column.

ALL-PURPOSE KNIGHT-Millers



KNIGHT Millers are fast, compact, complete and convenient to handle. Write for our catalog that pictures and describes various jobs being done.

TILTING TABLE: Large trunnion, on which is assembled the table unit, provides for tilting table in either direction. This feature and the one above add to the capacity of the machine.

35° TILT: The knee, actuated by large worm and gear, may be tilted 35° either side of horizontal thereby placing the table in position for angle boring or milling. Four heavy T-slot bolts solidly lock it in any position.

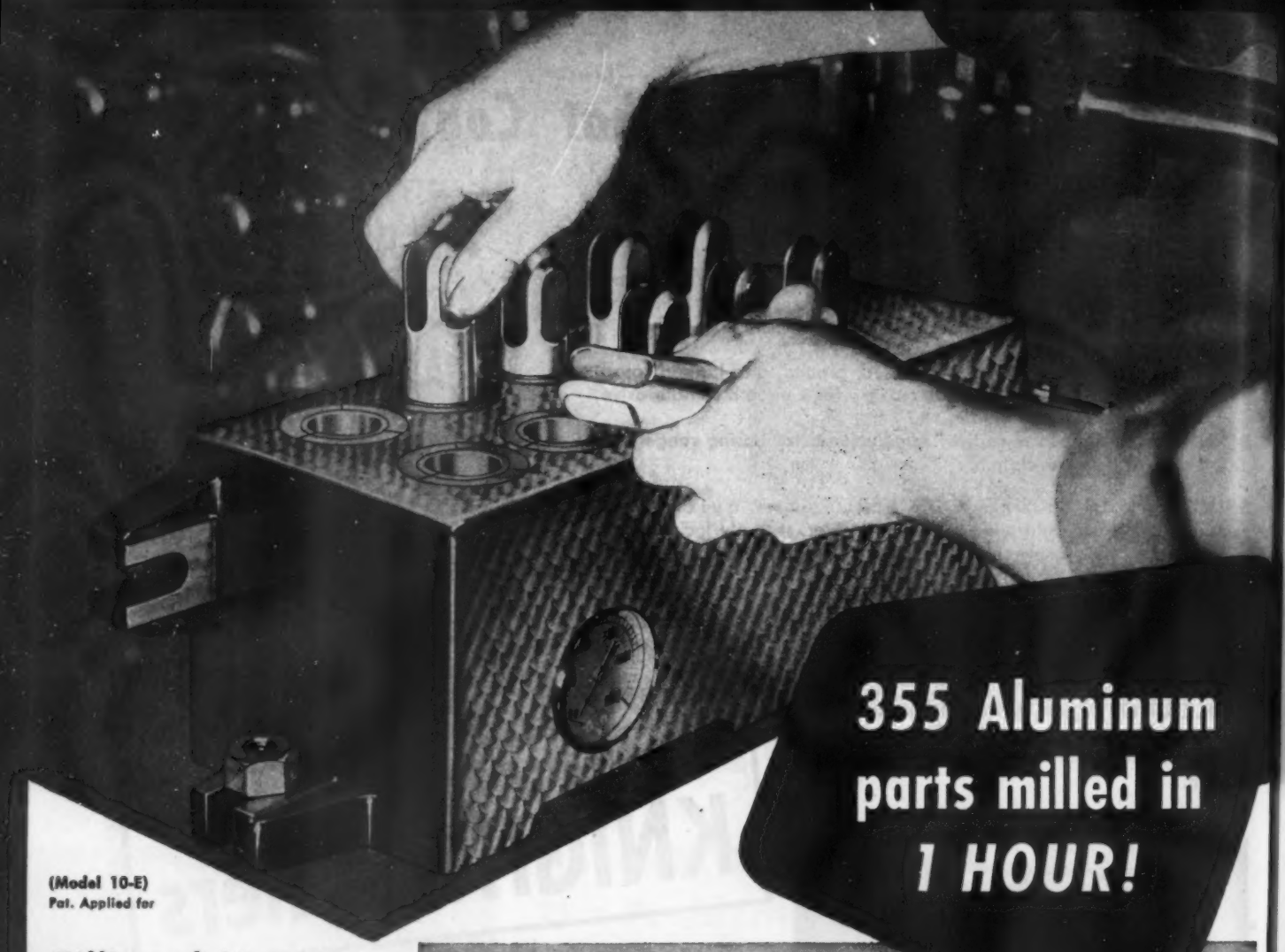
SAFETY FEATURE: Automatic safety throwout, built into feed mechanism, provides against over-loading and will not allow re-engaging table feeds until overload is removed.

MAINTAINING SQUARENESS: Eccentric bushing, in outer table unit support bearing, furnishes additional means of maintaining squareness between table and spindle.

POSITION OF UNIT IN DEGREES: Large worm for operating gear that tilts table unit. Graduated segment on right side of unit gives position of unit in degrees.

KNIGHT Millers subject to prior order for immediate delivery. Write for catalog.

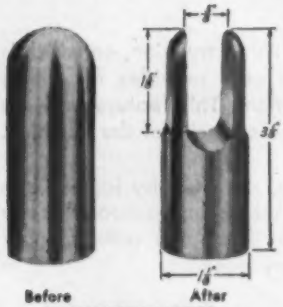
W. B. KNIGHT MACHINERY CO.
• ST. LOUIS, MISSOURI •



355 Aluminum parts milled in 1 HOUR!

(Model 10-E)
Pat. Applied for

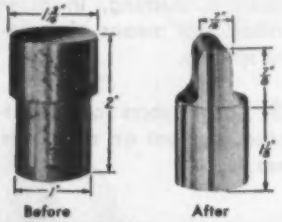
Milling of 10 parts simultaneously increases production 100-500%



Before After

ALUMINUM PARTS

These aluminum parts were milled upon the Aerco Multi-Grip Chuck at the rate of 355 per hour (floor to floor) as compared with single milling operations of only 71 per hour.



Before After

CHROME STEEL PARTS

These parts, high heat treated of Chromemoly, were produced at the rate of 62 per hour (floor to floor) on the Aerco Multi-Grip Chuck. Individual milling time was 15 per hour.

AERCO HYDRAULIC MULTI-GRIP CHUCK

check the operational features back of this record:

1. **A single loading for 10 parts:** new multi-grip chuck saves starting, stopping, cleaning fixture each time as with single-station units.
2. **No sacrifice of accuracy:** self-centering aligning collets insure perfect on-center milling regardless of slight shank diameter variations.
3. **Pressure built quickly:** hydraulic hand pump lever builds pressure up to 2500 p.s.i. with a few strokes.
4. **Quick re-loading:** self-opening collets are quickly re-loaded; adjustable depth stop for each collet eliminates necessity for gauges.
5. **Safe operation:** work is held rigidly in collets and cannot turn or be pulled out during milling operation. Safety stop prevents damage to collets should all stations not be filled.
6. **No waste milling motion:** Parts are held to minimum center distance eliminating cutting air — plus advantage of two rows which again doubles increased production.
7. **Variety of collet capacity:** #10-B chuck has round collet capacity from ⅛" to ½" inclusive. #10-E chuck has round collet capacity from ½" to 1¼" inclusive. Square and hexagon collets available for both chucks.

Representatives Wanted in Principal Cities

MANUFACTURED EXCLUSIVELY BY

AERCO CORP.

ARMY E NAVY

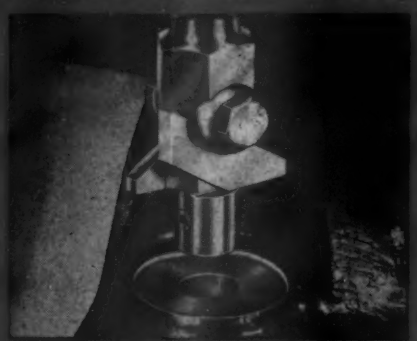
HOLLYDALE, CALIFORNIA

WRITE FOR NEW FOLDER

There's an Easier Way to Expand a Counterbore!

HERE'S HOW

With Clark *Adjustable* Counterbores, simply loosen the locking bolts and slide cutting blades in or out. Interchangeable pilots are available from 3/16" up, by sixteenths. 5 Clark Counterbores cover all fractional diameters from ¼" to 2" – 4 more tools cover 2" to 5½". Each Clark Counterbore does the work of seven or more fixed-radius cutters. Recommended surface speeds are faster, and without chatter. Order from your jobber today and solve your depth-counterboring and spotfacing problems for good.



AN OPERATION SAVED!
No de-burring of pilot hole required. Clark Counterbores give faster, cleaner cuts!

Complete, illustrated data concerning Clark Counterbores mailed upon request. Write for Bulletin AM-5

Robert H. Clark Company

9330 SANTA MONICA BOULEVARD ★ BEVERLY HILLS, CALIFORNIA

In Canada: DOMINION BEARINGS LTD. Toronto, Montreal, Winnipeg
Export: THE AMERICAN STEEL EXPORT COMPANY, INC. New York, Los Angeles

Another Clark Cutter that is Saving Time and Money

Clark Adjustable Hole Cutters take the place of many fixed radius tools in machine work, and are valuable in portable drills. Want details? Write for Bulletin AM-5[illegible]

These Wade Tools will help you get more Speed and Accuracy in your Precision Work

Wade Model 8-A Toolmakers' Precision Lathe: 8½ swing. 24 centers. 1 max. collet. Attachments available for special work.

Wade Hand Knurling Tool: 7 long. Capacity 3/32 to ¾ dia.

Wade

Bench Lathes and Profilers For Precision, Versatility And Stamina

Bench Model Profiler: Size 19 x 24 x 22 high. Work area 2 x 4 x 1¼.

Precision Screw Machine Unit: Equipped with Lever Closer, Double Cross Slide and Automatic Turret Attachment.

Wade standard Precision Lathe: 7 swing, either 21 or 32 bed. Three sizes available: ½, ¾ or 1 maximum collet capacity.

Write Today for Catalog

THE WADE TOOL COMPANY

WALTHAM 54, MASSACHUSETTS

This old gentleman's firm closed its doors in 1892

IT'S true that fine machines and tools function "satisfactorily" for a long, long time. But if your principal competitors invest in new equipment which does the same job in half the time and at half the cost, then your tools automatically become more of a liability than an asset.

Practically every plant in every industry will soon face the problem of changing over to civilian goods production. New materials, new processes and new standards of value will call for still greater ingenuity in machine tool design and performance. Sellers, with 95 years of know-how behind it, is working *now* for farsighted industrialists who plan to get a head start on post-war competition...Glad to work with you on similar problems ...Wm. Sellers & Company, 1610 Hamilton Street, Philadelphia, U.S.A.

SELLERS

Precision-Built Tools Since 1848

heavy duty Engine Lathes for

RAILROAD SHOPS

SHIPBUILDERS

HEAVY MACHINERY BUILDERS

Sommerfeld LATHES

DEPENDABLE ... ACCURATE

Wherever large diameter boring and turning are required, and a high degree of accuracy must be maintained under conditions of maximum production, Sommerfeld lathes serve dependably and well.

Made in sizes from 27 to 60 inch swing, any bed lengths. The larger sizes are available in two types; type BT can be used for simultaneous boring and turning, type T is for turning only.

Write for informative bulletins giving complete data on Sommerfeld Engine Lathes.

Sommerfeld
MACHINE COMPANY
BRADDOCK, PA.
Makers of Machine Tools since 1895

Find a better way of doing it!

a practical plan for methods improvement

Here is a concise manual of ways and means for improving manufacturing methods to help you cut costs, increase production, eliminate needless expense, and save valuable working time.

This book shows you in simple, non-technical language how to apply a systematic questioning attitude to analyze your methods and see how they can be improved.

Just Published

GUIDE TO METHODS IMPROVEMENT

By HAROLD B. MAYNARD

President Methods Engineering Council
and G. L. STEGEMERTEN

Staff Supervisor, Industrial Methods Engineering Dept., Westinghouse Elec. and Mfg. Co.

85 pages, 3 x 7½, $1.00

Here is a common sense handbook for all men who are looking for ways of increasing efficiency and speeding up production. It explains how to analyze an industrial operation, how to break it down into its component parts, and how to question each part systematically to bring out possible chances for improvement. It gives the major factors that must be considered in analysing any job, and for each lists a number of specific, practical questions, all of which have proved successful in the past in bringing about methods improvements. Typical examples of improvements resulting from these questions are shown in the appendix.

- Over 400 specific, idea-stimulating questions
- 10 general points for operational improvement
- 20 examples of actual improvements made

10 days' free examination

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FACTORS THAT ARE IMPORTANT TO BROACH EFFICIENCY!

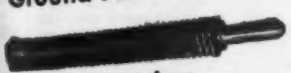
ILLINITE
PRECISION METAL CUTTING TOOLS

Ground Hobs

Milling Cutters

Ground Form Tools

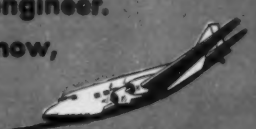
Shaper Cutters


Broaches

Special Tools . . . Gear Measuring Machines . . .
Gear Measuring Blocks . . . Die Filling Machines

A broach is a precision tool which requires unusual skill and experience in design plus a special proficiency in manufacturing.

To assure an exceptionally high degree of performance — both in the accuracy of the parts broached and, long life for the broach itself — we suggest that you discuss your next broaching job with an "Illinois Tool" engineer.
If you have such a problem now, send us complete details.



OVERNIGHT TO ALL AMERICA . . . FROM THE HUB OF AIR TRANSPORTATION

ILLINOIS TOOL WORKS

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In Canada: Canada Illinois Tools, Ltd., Toronto, Ontario

MANUFACTURERS OF METAL CUTTING TOOLS AND SHAKEPROOF PRODUCTS

AMEs Shockless

Hundred Series

DIAL INDICATORS

For tough jobs, where hammer-like blows at the spindle end break down ordinary indicators, AMES Shockless Indicators stand up and give uninterrupted service. The addition of a simple shock-absorber to the wheel assembly protects the gear train without changing the outside dimensions or appearance. Unlike any other indicator cushioning device, it is absolutely effective, does not reduce accuracy or sensitivity and saves repair expense.

Try some of the various sizes and models on your most punishing testing jobs and see how they will keep on checking fractions of the thousandth inch just as accurately after being pounded and jolted severely.

B. C. AMES CO.

WALTHAM, MASS.

BURKE MILLING MACHINES

. . . Put Your Small Work on a Production Basis!

These small, difficult jobs can be handled on a *production basis* with BURKE Motor Driven Milling Machines Nos. 1, 2, 3, & 4. Primarily, this is because BURKES have been *specially designed and built* to do smaller milling jobs efficiently and economically.

Then, too, a number of attachments are available . . . attachments that increase the units usability, and add to your productivity. These include a vertical milling attachment, index centers, and vises—3 types, including swivel base. Now, when production must be stepped up, is the time to investigate the profit possibilities of BURKE Milling Machines, as applied to your work.

Complete Information Will Be Sent You Upon Request — Write!

BURKE MACHINE TOOL CO.

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ROTOREX UNIVERSAL GRINDER

Internal grinding Attachment

Cylindrical grinding Attachment

FOR SHARPENING and PRODUCTION

PRECISION BUILT to perform two jobs—Production work such as cylindrical and internal grinding and sharpening of all kinds of tools.

The keynote of the Rotorex is simplicity, accuracy and flexibility.

Compact and simple in design with a minimum number of working parts in conjunction with conveniently located controls.

Precision built for sustained accuracy because of good workmanship.

The variety of work it handles is attained by a wide range of attachments for faster set-ups. Selective speed range from 3000 to 6000 R.P.M.

Sharpening a Helical Cutter

DOUGLAS MACHINERY CO., Inc.

144 BROADWAY, NEW YORK, N. Y.

SAVE *Time, Labor, Cost*

WHEN CUTTING LONG OR BULKY WORK!

Workpieces of wide area often cause costly jams in production lines — unless you speed the work on its way with versatile Walker-Turner Metal-Cutting Radial Machines and Band Saws.

These fast, accurate machines relieve overworked, heavier cutting units, and even serve as "first line" production equipment on lighter work. Their wide range of speeds brings practically all materials within their scope. Their simple, easy operation makes every man-hour more productive.

Write today for detailed literature.

WALKER-TURNER CO., INC., PLAINFIELD, N. J.

METAL-CUTTING RADIAL MACHINE

Cutting wide, metal stock is easy with the Walker-Turner Metal-Cutting Radial Machine. Sliding ram design permits transverse travel of 21½". Geared motor—with saw shaft at bottom edge—permits deep cuts with smaller blades than in conventional motors and effects substantial savings in blade costs. Universal head makes mitering and compound mitering, as easy as straight cutting.

METAL-CUTTING BAND SAW

. . profiling irregular dies . . . cutting sheets, rods and tubes of steel, iron, aluminum, brass, alloys and compositions —those are a few of the jobs Walker-Turner Metal-Cutting Band Saws are doing quickly, accurately, economically. Available in 14 and 16-inch models, these rugged, compact machines provide a speed range from 61 to 5300 s.f.m.

walker-Turner
COMPANY, INC.
PLAINFIELD, N.J.
U.S.A.

MACHINE TOOLS

DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

for DIES, MODELS, PATTERNS, JIGS, MILLING, etc.

with Speed and Accuracy

The number of small jobs in a busy toolroom far surpasses the larger ones . . . a logical reason for having compact, high speed equipment like the LINLEY vertical MILLING and JIG BORING machine. It enables toolmakers to make fast set-ups, quick changeovers for speedier work, more jobs, in minimum time . . . and with the required accuracy.

FEATURES

- Eight spindle speeds, 275 to 4250 r.p.m.
- Direct micrometer setting.
- Backlash of quill travel eliminated.
- Grease sealed bearings need no adjustment.
- Ample table size . . . 7" x 17½"
- Table top to spindle end . . . 11½"
- Small Floor space . . . 18½" x 20"

Simple in operation and set-up, yet a precision tool in the fullest sense. The Linley is a money-maker in any shop.

Send for Bulletin

LINLEY BROTHERS COMPANY
664 STATE ST. EXTENSION
BRIDGEPORT 1, CONN

LEACH External Grinder

Price reduction made possible by increased production.
~~PRICE $985.00~~
$875.00
Fully Equipped

Our dealers will help you fill out necessity priority forms.

Write us today for your nearest dealer's name and address.

Grinds Work from ¾" to 11" in length and from ⅛" to 7" in diameter.

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EXCELLENT DELIVERIES

Exclusive Selling Agents
H. LEACH MACHINERY CO.
387 CHARLES ST. PROVIDENCE, R. I.
Agents in all Principal Cities Throughout the World

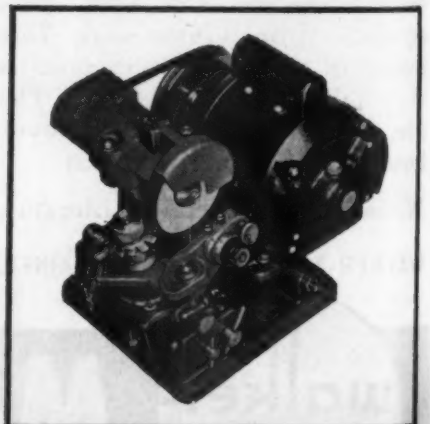
KEEP THOSE CUTTERS SHARP BY USING THE NEW

Waltham CUTTER SHARPENER

During this labor shortage — while H.S.S. is scarce — when quality production is vital — you *must* keep your cutters sharp. The New Waltham Cutter Sharpener will sharpen gear cutters, thread milling cutters, circular form tools, straight fluted hobs and multiple cutters, up to 2" diameter and ⅜" thick.

The Waltham Cutter Sharpener can be used on any handy bench by the same operator who uses the cutters on other machines.

Sharp cutters are economical cutters — keep them sharp — get maximum accuracy and production — investigate the Waltham today by mailing the coupon for your copy of new, illustrated folder.



Available with index plates or pawl locating attachment.

EDWARD BLAKE CO.

634 COMMONWEALTH AVENUE
NEWTON CENTRE 59, MASS.

Please send me the new folder giving full details on the Waltham Cutter Sharpener.

Name ..... Title .....

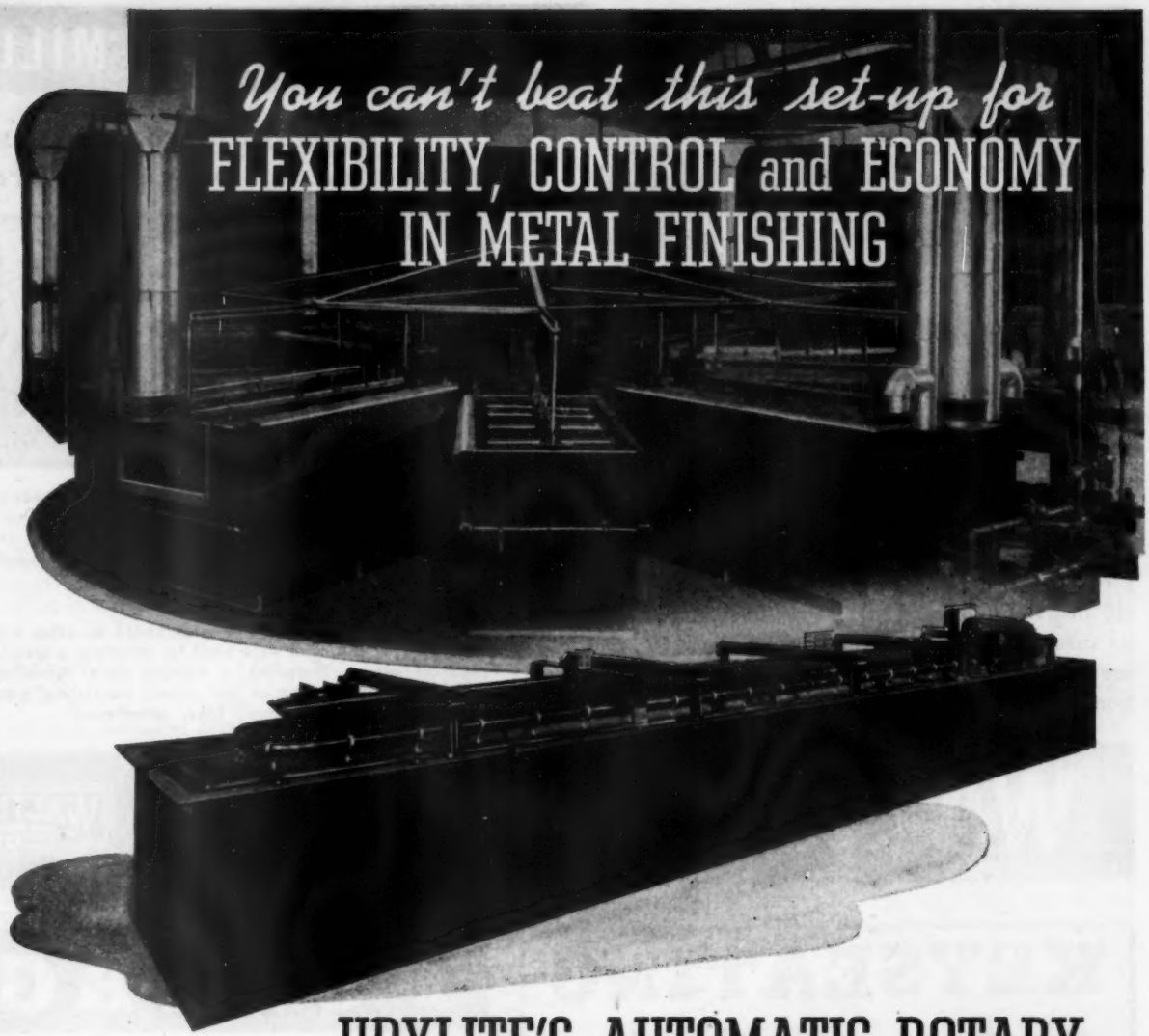
Company .....

Street .....

City ..... State .....

A.M.

BLAKE TAP GRINDERS — L & D HIGH SPEED DRILL PRESSES — WALTHAM CUTTER SHARPENERS — AMERICAN TOOL WORKS — BLACK DIAMOND PRECISION DRILL GRINDER — FITCHBURG [illegible]



UDYLITE'S AUTOMATIC ROTARY CONVEYOR WITH THE UDYLITE SEMI-AUTOMATIC PLATING MACHINE

If your metal finishing requirements call for exacting process and production control. If you could use the many advantages of a full automatic machine, at a fraction of the cost of such a machine, then you will want to investigate the above combination developed by Udylite's engineers.

The first cost of this set-up is amazingly economical. Their *flexibility* in converting from one use to another is new to the field. The clean and rinse cycle may be changed without altering plating time and one Udylite Automatic Rotary Conveyor, operating a clean and dry cycle, can serve a number of plating semi-automatics, each plating a different type of part.

It sounds too good to be true but it's a fact. We will be glad to discuss it with you.

THE UDYLITE CORPORATION

1651 E. Grand Blvd., Detroit 11, Mich.

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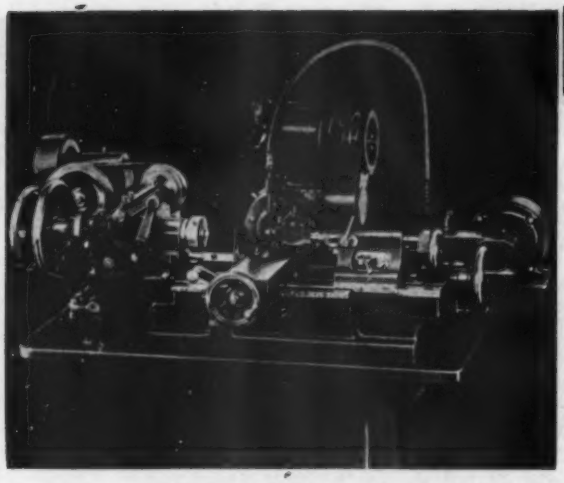
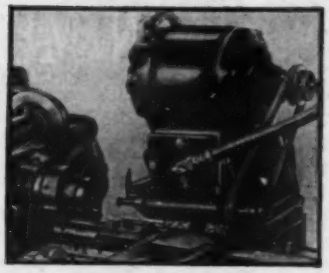
Long Island City 1, N. Y.
11-16 44th Drive

Cleveland 3
4408 Carnegie Ave.

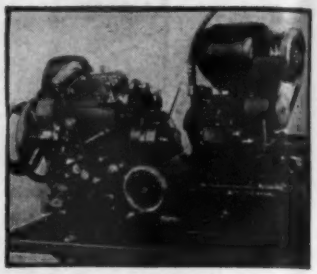
WALTHAM THREAD MILLERS



for fast, versatile and convenient production of precision threads



Internal Thread Milling Attachment applied to machine.



Machine equipped with Relieving Equipment.

All standard forms of threads can be produced accurately and easily on these improved machines. Cutters for threads required are available from Waltham. Three motors on these machines (for speed, feed and oil) permit great flexibility in operation as well as an assured supply of coolant at all times. Motors are wired so that all can be controlled at one time from a single start and stop station.

Send for descriptive literature and detailed specifications.

SPECIAL EQUIPMENT

The utility of these machines is greatly extended by extra equipment available, which includes: a special work head for relieving; a special motor driven cutter head for internal threading; a multiple cutter threading attachment; automatic cam operation; special tail stock; translating gears for cutting metric threads; metric lead screw; taper attachment.

WALTHAM MACHINE WORKS

WALTHAM, MASS.

WALTHAM TRADE MARK REGISTERED U.S. PAT. OFF.

KEYSEATING

The Modern Way

Illustration shows typical set-up for cutting taper keyways with table tilted.

Machines are made in three sizes for keyways 1/16" to 1¼" in width.

Great simplicity and ease of operation of Davis Keyseaters assure the user of accurate, time saving work.

Let our engineer study your keyseating problems.

DAVIS KEYSEATER COMPANY

403 EXCHANGE ST. ROCHESTER, N. Y.

PORTAGE

HORIZONTAL BORING, DRILLING AND MILLING MACHINE NO. 4

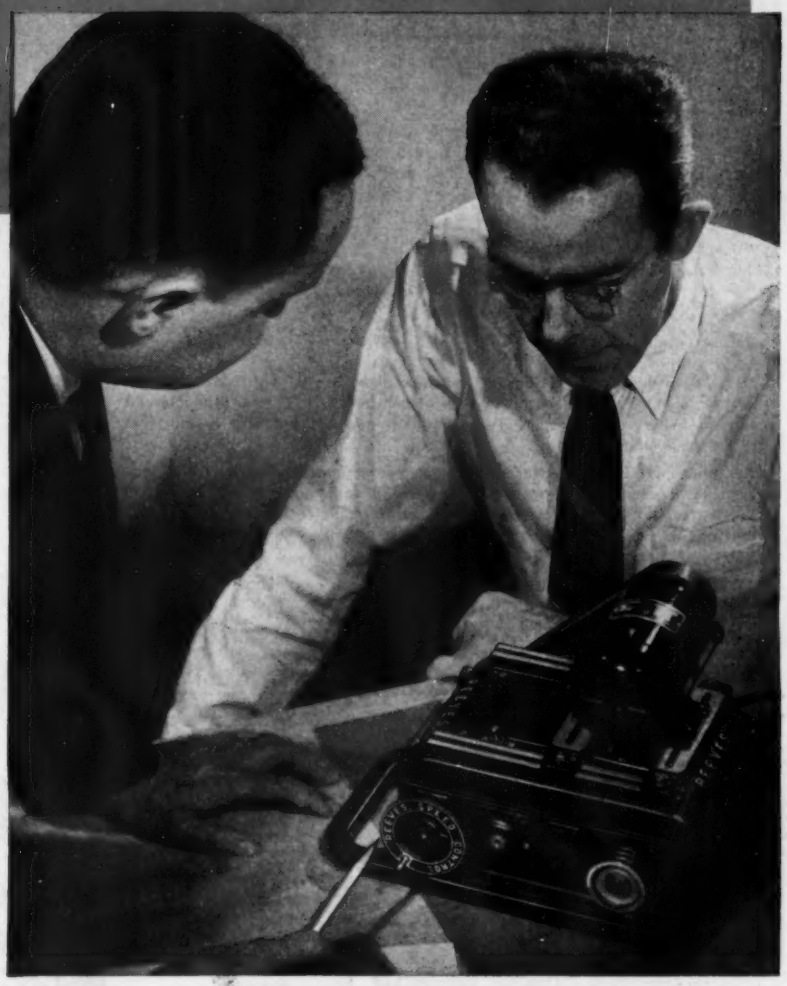
• Featuring an extended saddle and table with outer rail support for maintaining exceptional accuracy on long work. Get fully acquainted with the many features of this modern Boring Mill. *Ask for a copy* of our new instructive bulletin which points out the numerous advantages of this new Horizontal Boring, Drilling & Milling Machine.

THE PORTAGE MACHINE CO.

AKRON 11, OHIO

SPEED CONTROL QUIZ

. . . a quick summary of what can be accomplished with REEVES Speed Control Units



Q. What is the range of speed variation?

A. REEVES units are available in speed variations from 2:1 to 16:1 ratios inclusive, although most installations require no more than a 4:1 range. Actual driven speeds can be secured, through reduction or increase, to provide as low as fractional r.p.m. or as high as 12,000 r.p.m.

Q. What horse power capacities?

A. Sizes from ¼ to 90 h.p.

Q. How about transmission of power—is it positive at all speeds?

A. There are countless installations of REEVES units where the slightest amount of slippage would invalidate all benefits—such as on cut-off saws, rayon spinning, etc. The answer is yes—the transmission of power is absolutely positive at all speeds.

Q. What are the torque characteristics?

A. Constant torque; power transmitted is proportionate to speed. REEVES units do not drop off sharply in h.p. at any low speeds. Constant h.p. with variable torque rated units also available.

Q. How about remote control? Operator is often at considerable distance from the drive.

A. REEVES Electric Remote Control is available with one or more push button stations, which can be located at any convenient place.

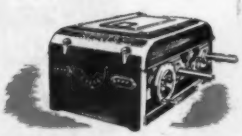
Q. Can speeds be changed automatically?

A. Yes. Actuation for automatic control can be taken from many sources, depending on material being processed. REEVES Hydraulic Automatic Control is especially suited to wide applications, being highly sensitive to change in controlled material. Pressure of only 2 or 3 ounces will produce desired changes in speed. Mechanical and differential also available. All are based on REEVES broad experience in installing automatic variable speed control.

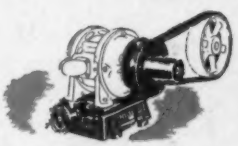
Q. Are the units easy to service?

A. Here's what one user says: "Anybody with a wrench and screw-driver can keep a REEVES Transmission running." And this user has 3 units that have been operating in his plant since 1904.

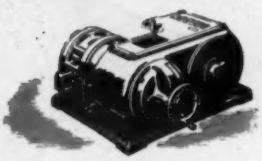
The 3 Basic Units of the REEVES *Line*



VARIABLE SPEED TRANSMISSION for providing infinite, accurate speed flexibility over wide range. Send for Catalog T-443.



VARI-SPEED MOTOR PULLEY converts any standard constant speed motor to a variable speed drive. Send for Catalog V-440.



MOTODRIVE combines motor, speed varying mechanism and reduction gears in single compact unit. Send for Catalog M-441.

• More complete information, including h.p. ratings, speed ranges, dimension tables and full description of each Basic Unit in REEVES line—is yours for the asking. Note catalogs offered above.

REEVES PULLEY COMPANY • DEPT. A • COLUMBUS, INDIANA

REEVES *Accurate Variable* SPEED CONTROL

Bridgeport

TURRET MILLING MACHINE

MILLS, DRILLS, BORES *and* SHAPES AT ALL ANGLES WITHOUT CHANGING SET UP

This universal machine is many machines in one. Its versatility and scope of operations are without parallel. Equipped with the universally used "Bridgeport" Milling Attachment, milling, drilling and boring at all angles can be handled at a single set up and with utmost precision.

While furnished as standard equipment on the Bridgeport Turret Milling Machine, the Bridgeport High Speed Milling Attachment can be mounted on any type of milling machine as well as special production equipment.

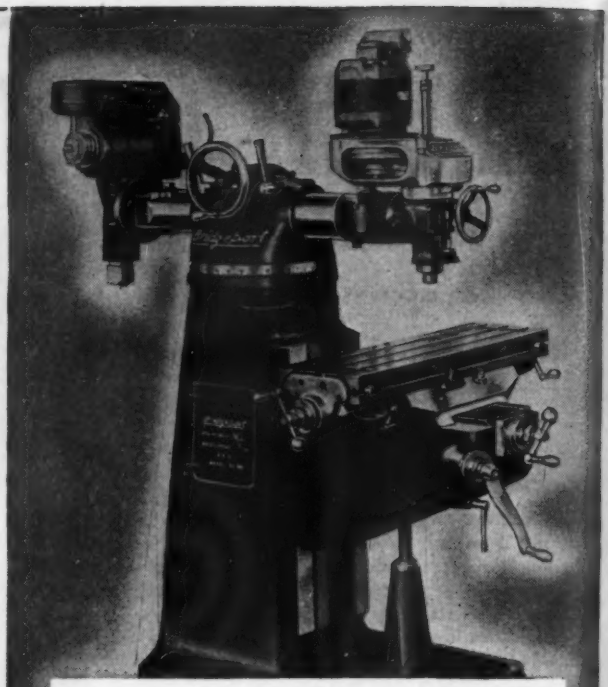
. . . *and* NOW A SHAPING ATTACHMENT

Tremendous demand for Bridgeport Machines has delayed until now the production of this much needed Shaping Attachment. It is now available not only to owners of Bridgeport Turret Milling Machines but also to machines of other manufacturers.

The Bridgeport Shaping Attachment (mounted on back end of overarm) provides the means for shaping and slotting at all angles and on a wide variety of work such as dies, mold work and intricate production jobs. It is of sturdy construction and convenient to use.

Write for Illustrated Bulletins giving complete details

THE BRIDGEPORT MACHINES, Inc., Bridgeport, Conn.



Specifications

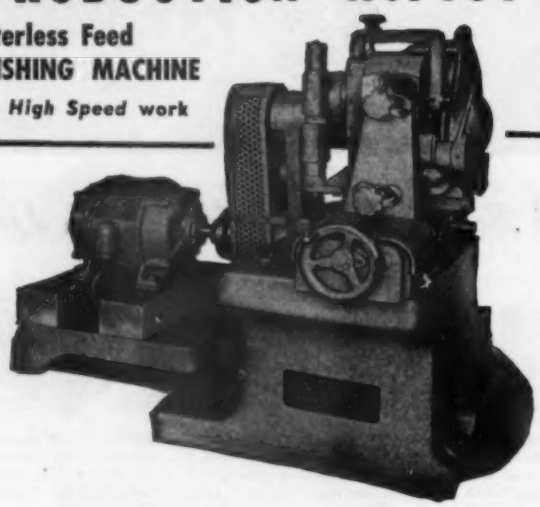
MACHINE	MILLING ATTACHMENT
Longitudinal Feed—20" Cross Feed—9" Vertical Feed of Knee—16" Spindle to Table—17" Table—9" x 32"	Spindle Speeds, 275, 425, 700, 1050, 2100, 4250 Quill Travel—3½" No. 2 Morse or No. 7 B&S taper spindle ½ HP Motor

"PRODUCTION" No. 101

Centerless Feed POLISHING MACHINE

For *High Speed* work

Write for complete details



This machine assures better finishing at lower costs. Operation is extremely simple. Work is just fed automatically, and requires no centering, chucking or holding. It is ideal for polishing tubes, rods, bars and similar cylindrical work.

Features include ball bearing shaft, V-belt drive, adjustment of feed to meet diameter of work and wheel trueing while in operation.

PRODUCTION MACHINE CO.

Manufacturers of Drilling Machines, Tool Grinders and Hand and Automatic Polishing and Grinding Machines.

GREENFIELD, MASS., U. S. A.

Variable Speed

SPEED LATHES *for* PRECISE LAPPING OF GAGES

Ideal FOR FINAL FINISHING OPERATIONS

Speeds as low as 20 r.p.m., for accurate lapping of gages, and as high as 4,000 r.p.m., (with ample power for rotating heavy work), for de-burring, polishing, filing, etc., are available in these foot-operated speed lathes. Speeds are infinitely variable. Write for Catalog 460.

SCHAUER MACHINE COMPANY

ORIGINATORS OF TODAY'S SPEED LATHES

2067 READING ROAD . . . CINCINNATI 2, OHIO

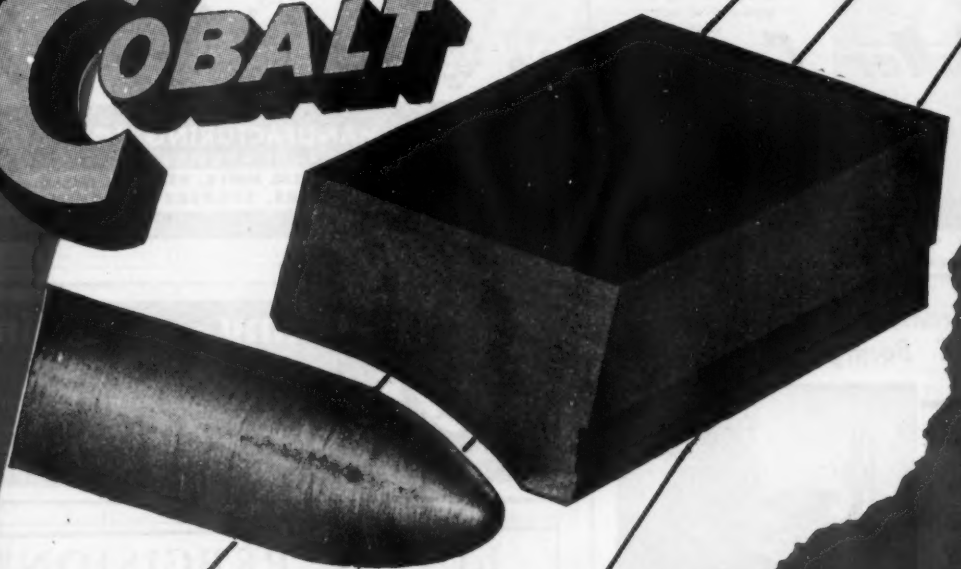
282%

Longer Tool Life between Grinds...

FINISH · FORMING

Armor-Piercing Shell

VICTORY COBALT

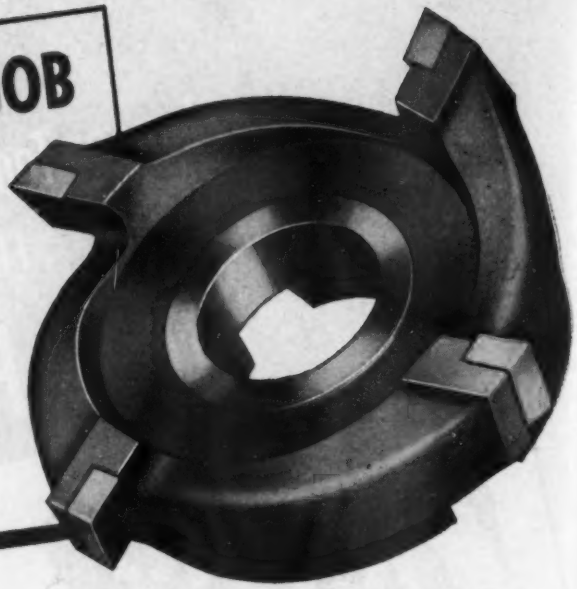


"Tough Master of Tough Jobs"

Vanadium-Alloys

STEEL CO. LATROBE, PA.

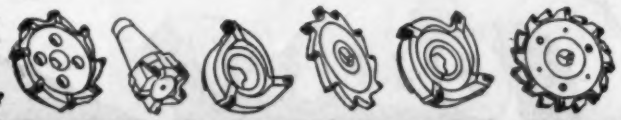
HOW TO LICK A 1-HOUR JOB *in 5 minutes...*



Cal-Cutters the high production carbide tipped milling cutters, operate at feeds and speeds that can't be approached by high speed steel tools. That's why many jobs that formerly required hours can now be done in *minutes* alone! But high milling feeds and speeds are not their only advantage—Cal-Cutters produce far smoother surfaces, stay on the machine without frequent resharpening and actually lower your machining costs on a cost-per-piece basis.

Cal-Cutters are made in a wide range of sizes and types for milling everything from the toughest alloy steel to soft aluminum—and do it at a saving. Write for our newest catalog 381-A illustrating latest Cal-Cutters.

You can mill it faster —and mill it better— with **Cal-Cutters**



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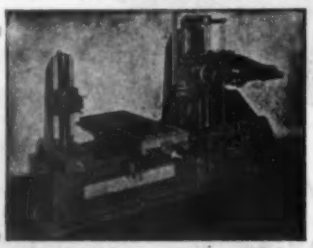
1915 EAST 51st STREET • LOS ANGELES 11, CALIFORNIA
Vernon Line of HORIZONTAL MILLS, VERTICAL MILLS and JIG BORERS, SHAPERS and GRINDERS

UNIVERSAL *Horizontal Boring Machine*
The only TRIWAY *Boring Machine Built*

Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.



Standard Universal 3" Spindle Machine

UNIVERSAL BORING MACHINE CO.
Hudson, Mass., U. S. A.

Drilling and Tapping Machines
(Automatic and Semi-Automatic)
LELAND GIFFORD CO.
WORCESTER, MASS.

LUCAS "PRECISION"
Horizontal Boring, Drilling and Milling Machine
THE LUCAS MACHINE TOOL CO.
NOW AND ALWAYS OF
CLEVELAND
OHIO, U. S. A.

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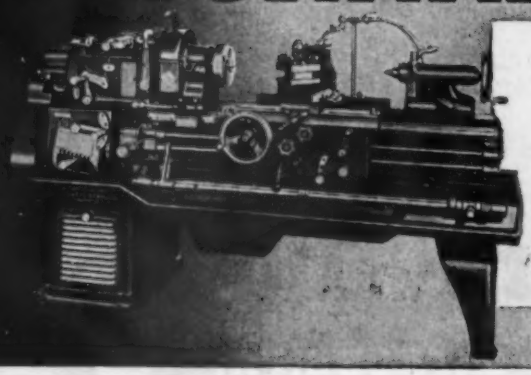

ASSURING HEAVIEST CUTS AT HIGHEST SPEEDS WITH MAINTAINED ACCURACY

Cincinnati Lathes are produced to handle heavy duty work with ease and precision. They are powerful, rugged, fast and convenient with every detail of design and construction developed to assure long-lived accuracy under full capacity operation. Available in sizes from 14" to 30", with 12 or 24 speeds and 32 to 96 feeds. Our latest catalog gives complete details. Write today for your copy.

THE CINCINNATI LATHE & TOOL CO.
Rogers Road, Oakley SPECIALISTS SINCE 1906 Cincinnati, Ohio

This Clutch has a War Record

Performance under the severest conditions—that's the uniform comment of users of the Fawick Airflex Clutch.

This new, but tried and proved, clutch controls power by air pressure. It absorbs shocks and vibration, without moving parts, arms, levers or springs. Requires no adjustments, no lubrication—maintenance costs are very low. Operates as clutch, brake, slip-clutch or flexible coupling.

In Naval use, under combat conditions, the Fawick Airflex Clutch gives a degree of maneuverability and dependability never before known!

It has also proved itself for heavy duty drives in such industries as steel, paper, rubber, material handling, mining, petroleum, electric power, metal forming and dredging.

Consult us on your difficult clutch installations. Our engineering department will gladly advise with you.

12 IMPORTANT ADVANTAGES

1. Simple in design and operation.
2. Flexible control by air.
3. No adjustments or oiling—low maintenance.
4. Dampens vibration—absorbs shocks.
5. Corrects misalignment automatically.
6. Smooth starting—no jerks.
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8. Controls torque by air pressure.
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FAWICK AIRFLEX COMPANY, INC.
9919 Clinton Rd. Cleveland 11, Ohio

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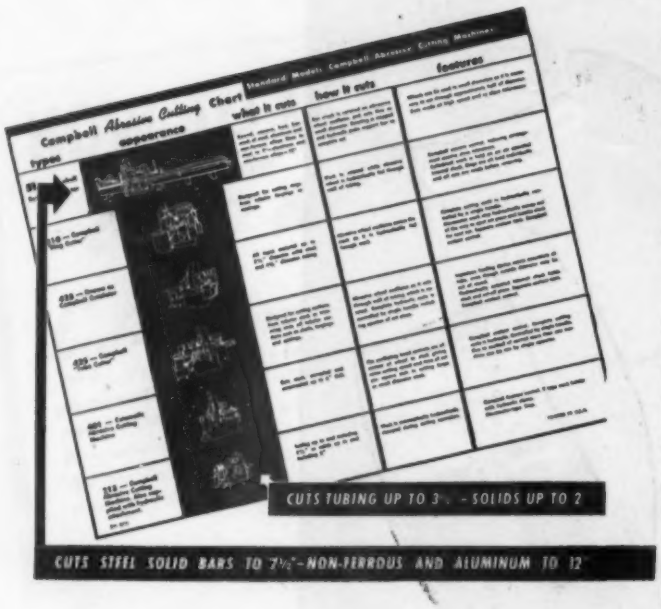
FAWICK *Airflex* CLUTCH

POWER CONTROLLED BY AIR


Campbell Abrasive Cutting Chart
Standard Models, Campbell Abrasive Cutting Machines
Types
appearance
what it cuts
how it cuts
features
CUTS TUBING UP TO 3" - SOLIDS UP TO 2
CUTS STEEL SOLID BARS TO 7½"-NON-FERROUS AND ALUMINUM TO 12

Ask a Campbell Engineer to suggest cutting procedure and figure costs for your cutting . . .

CAMPBELL manufactures a complete range—in fact, the *only* complete range—of machines for abrasive cutting. 8 types, 19 models and countless variations developed to meet the jobs of cutting steels, annealed and unannealed; non-ferrous metals, plastics, glass and ceramics—solid bar, tubular and flat stock.

One corporation alone has found **CAMPBELLS** so efficient that they now use 120 **CAMPBELL CUTTING MACHINES** in their several plants.

Call on this wide experience of **CAMPBELLS** and ask them what cutting procedure they would recommend for your plant—what the cost per piece would be. It doesn't put you under any obligation to do this but be sure to state materials you cut, shapes, lengths before cutting, lengths of cut-off pieces and production desired per hour.

Campbell

ABRASIVE CUTTING MACHINES

ANDREW C. CAMPBELL DIVISION
BRIDGEPORT • CONNECTICUT
ALSO MAKERS OF A COMPLETE LINE OF NIBBLING MACHINES

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AMERICAN CHAIN & CABLE COMPANY, Inc.
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In the MARINE TRADITION!

Machines and machine tools as well as men must measure up to MARINE CORP standards before acceptance . . . must be capable of handling whatever situation arises. That is why we are proud that SHELDON LATHES were selected for the Marine Trailerized Machine Shops as well as for the Army's "Mobile Machine Shop and Mobilized" Instrument Repair Shop Units, and as the maintenance lathes for many Navy craft. Modern battle equipment requires precision machinery. Operation under battle conditions requires rugged, reliable and dependably accurate machine tools. In SHELDON Precision Lathes all of these requirements are fulfilled.

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Die-Making Machines

They save 50% on sawing, filing and lapping operations, easily maintaining .002" limits. Ask for special bulletin —also circulars on Drill pointers. Point Thinners, Mill cutter Grinders and Tap Grinders.

OLIVER OF ADRIAN PRODUCTS

Oliver Instrument Co., 1414 Maumee St., Adrian, Mich.

SMITH & MILLS
CRANK SHAPERS
sizes 12" to 32" stroke
THE SMITH & MILLS CO. Cincinnati, Ohio

MILLHOLLAND

Automatic **DRILLING - BORING MILLING - TAPPING** Units

½ to 20 HORSEPOWER DRIVE

AUTOMATIC and SEMI-AUTOMATIC PRODUCTION MACHINERY

W. K. MILLHOLLAND MACHINERY CO.
Indianapolis, Ind.

MILLING CUTTERS • BROACHES • FORM TOOLS • END MILLS • HOBS

GEAR CUTTERS • UNGROUND GEAR AND SPLINE HOBS • GROUND AND UNGROUND MULTIPLE THREAD MILLING CUTTERS

COUNTER BORES • REAMERS • STANDARD END MILLS AND MILLING CUTTERS FROM STOCK • SPECIAL CARBIDE TIPPED TOOLS

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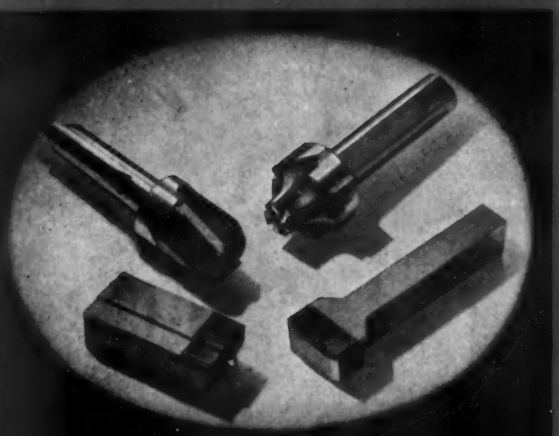


LAKE SHORE CARBIDE TIPPED TOOLS GET FIRST CALL IN MANY FAMOUS PLANTS FOR ACCURACY, HIGH SPEED PRODUCTION AND LOW COST.

MILLING CUTTERS • BROACHES • FORM TOOLS • END MILLS • HOBS

Back of every Lake Shore Tool are the facilities and skilled personnel of one of America's most completely equipped plants.

LAKE SHORE TOOL WORKS INC.

Send us your blue prints for quotations on your high speed tool, special tool, and carbide production tool requirements.

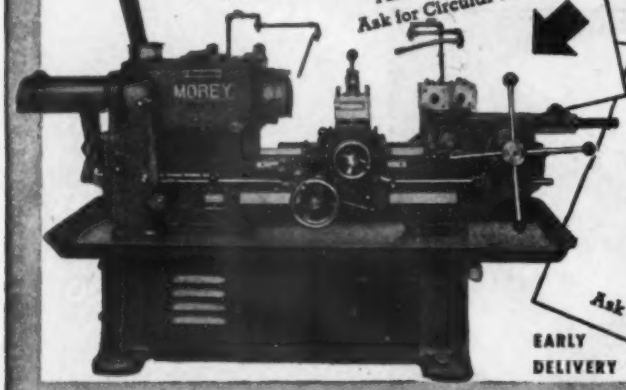
816 NORTH KOSTNER AVENUE • CHICAGO 51, ILLINOIS

MOREY TURRET LATHES
for BAR or CHUCKING { UNIVERSAL or PLAIN

3 UNIVERSAL
For bar stock up to 1½" in diameter
10" turning length
16½" swing over bed
Infinite spindle speeds: 55 to 1800 RPM. constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 727A

2 PLAIN-GEARED
For bar stock up to 1" in diameter
Turning length 6½"
Swing over cross slide 6"
Swing over bed 14"
Infinite spindle speeds:
Minimum of 60 RPM.
Maximum of 2000 RPM.
Constant horsepower at all speeds.
Ask for Circular 629A

4 UNIVERSAL
For bar stock up to 2" in diameter
12" turning length
13½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 736A



EARLY DELIVERY

- INFINITE SPINDLE SPEEDS —Electrically Selected—
- DIRECT BELT DRIVE AVAILABLE AT HIGH SPEEDS ELIMINATES GEAR MARKS (patents applied for).
- GEARED SPINDLE SPEEDS INSTANTLY AVAILABLE THROUGH MULTIPLE DISC CLUTCHES.
- SPINDLE MOUNTED ON TIMKEN BEARINGS.
- RIGID—WITH SUFFICIENT POWER TO TURN AT THE HIGHEST SPEEDS AND FEEDS MODERN TOOLS WILL WITHSTAND.
- SPINDLE SPEEDS AND POWER FEED CHANGES WITHIN EASY REACH OF OPERATOR.

ARMY E NAVY

- THE DESIGN OF THE MOREY No. 2, 3 and 4 TURRET LATHES ARE BASICALLY ALIKE. EACH MACHINE IS ENGINEERED FOR THE SIZE WORK IT IS DESIGNED TO HANDLE.

DESIGNED AND BUILT BY
MOREY MACHINERY CO., INC
410 BROOME STREET, NEW YORK 13, N. Y.
PLANT: 4-57 26TH AVE., ASTORIA 2, NEW YORK

The NEW "ABRASAW" No. 47
CUT-OFF MACHINE

This pedestal type machine — improved and streamlined in appearance and construction — provides machine and base in a single casting. Large coolant tank is now in base of machine with coolant pump at the rear.
Vises can be furnished for straight or combination straight and angle cuts.
Capacity: Solids up to 1"; tubing and light sections up to 2".
Floor Space: 28" x 50".
Send for complete details.

THE BRIDGEPORT SAFETY EMERY WHEEL CO.
1286 W. Broad St., Bridgeport, Conn.

Giant KEYSEATERS
For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.
MITTS & MERRILL
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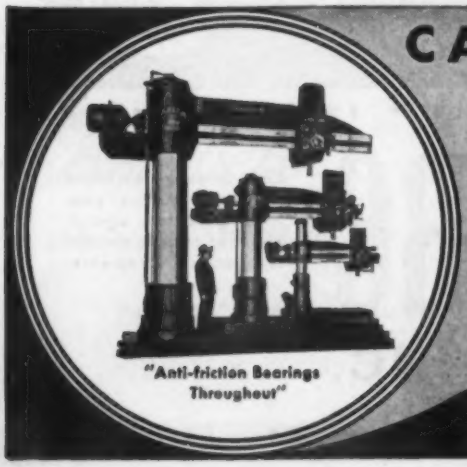
DIES TAPS
GEO MET RIC
Right in the Lead
THE GEOMETRIC TOOL CO.
NEW HAVEN 15, CONN.

CARLTON RADIAL DRILL
FEATURES—1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.


"Anti-friction Bearings Throughout"

The
CARLTON
MACHINE TOOL COMPANY
CINCINNATI, OHIO, U. S. A.

ARMY E NAVY

STERLING

THE WHEELS OF INDUSTRY

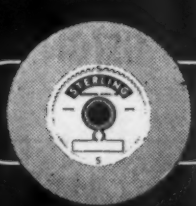
Speeding UP Our Wheels And Your *Production*

Your workmen turn out better work faster when they know their tools are safe. That is why we test all Sterling Grinding Wheels beyond their recommended speeds—to be certain you have long, trouble-free operation. This takes time and extra workers, but is well worth it in the resulting increased confidence foremen and operators have in the "Wheels of Industry".

Running your Sterling Grinding Wheel at its recommended speed is a certain way to obtain longer, more efficient grinding service. Then, the wheel's special bond, grain, and structure have a chance to get in their best work on your jobs.

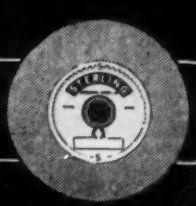
The problem of finding the correct wheel for your work need not be difficult . . a consultation with a Sterling engineer will often create new opportunities for increasing production, sometimes at much lower cost. Sterling investigation is as thorough as our wheel testing . . write today . . a Sterling engineer will gladly call and work with you on grinding problems of wartime or post-war production.

Sterling Catalog No. 43 is recommended reading for anyone desiring full information on all types of grinding. Sent free upon request.

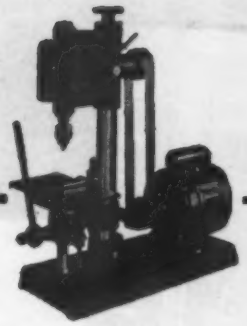


• STERLING ABRASIVES •

THE
STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO

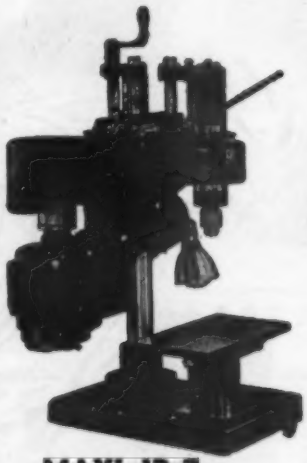


THE WHEELS OF INDUSTRY



HAMILTON MUEHLMATT SENSITIVE TAPPER

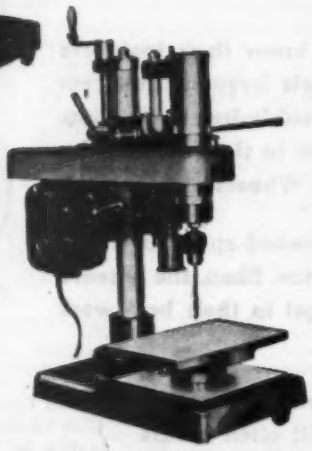
A high production sturdy little machine particularly suited to precision tapping of light work—instruments, cameras, watches, clocks and the like. Easy to operate—can be attached to any light socket.



"VARIMATIC"

Built with instrument precision allows instantaneous variable speed adjustment in two ranges. Low range 840 — 270 R.P.M. High range 2900—9300 R.P.M. Drill capacity .004" to 5/16".

MAXI-JR-E



Designed and built for accurately drilling small holes .004" to .250" diameter. It consists of a self contained drilling unit which swings radially on the column and may be locked in any desired position. This extremely flexible small drilling machine may be ganged for sequence operations or to increase production. Spindle speeds from 750 to 21,000 R.P.M.

The "Varimatic" and the Maxi-Jr.-E each feature a full floating spindle of special design which eliminates radial belt pull on the spindle.

•

Write for full particulars on any or all of the machines shown.

The Hamilton Tool Co.

830 NINTH ST HAMILTON, OHIO

SIGOURNEY M-100

STRENGTH
ACCURACY
RIGIDITY

•

drills down to .008" diam.

Sigourney M-100 Drilling Machines have the built-in strength and rigidity that mean a high degree of maintained accuracy on the most exacting precision drilling. They will drill holes from .008" to ¼" in diam. Available in 1, 2, 3, and 4 spindle models . . . speeds from 4,000 to 10,000 r. p. m. . . . all moving parts completely enclosed for maximum operating safety.

Send for illustrated bulletin.

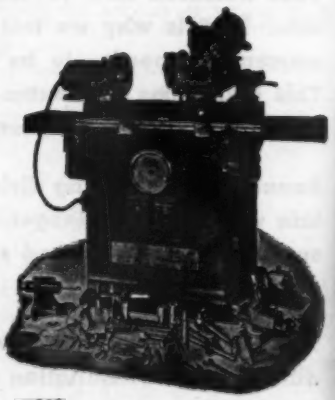
THE SIGOURNEY TOOL CO.
Hartford 6, Conn.

Sole Sales Agents

PRATT & WHITNEY

Division Niles-Bement-Pond Co. West Hartford, Connecticut

GRAND RAPIDS No. 6



ULTRA MODERN CABINET BASE

TOOL and CUTTER GRINDER

with

BALL BEARING TABLE AND OTHER EXCLUSIVE FEATURES

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EXTREME FLEXIBILITY FOR COMPLEX GRINDING OPERATIONS

GALLMEYER & LIVINGSTON CO.

330 Straight Ave. S. W., Grand Rapids 4, Mich., U. S. A.

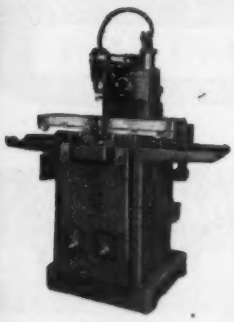
Call on

KENT-OWENS

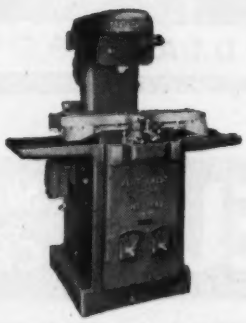
for Milling Machines

Rugged...
Simple...
Efficient...

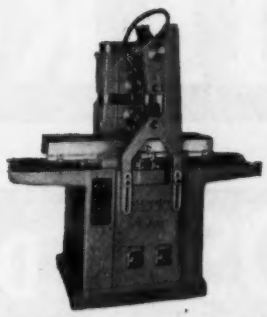
No. 2-20...20" table travel...42" x 12" table...full automatic hydraulic table feed.



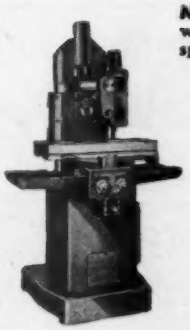
No. 1-14...32" x 9" table.. 14" table travel...hydraulic table feed...full automatic cycle.



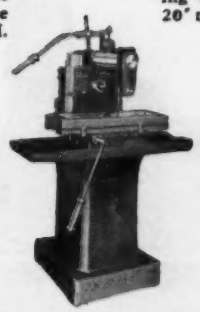
No. 1-14V... 14" table travel with full automatic cycle...spindle speed range 115 to 3000 R. P. M.



No. 2-20DS...Double Spindle Machine for performing two milling operations at same time... 20" table travel...42" x 12" table.



No. 1-V...Hydraulic vertical head feed...5½" head travel...25" x 9" table.



No. 1-M...Hand feed to table and head...25" x 9" table...1 H. P.... head counterbalance is adjustable.

THERE'S A KENT-OWENS REPRESENTATIVE NEAR YOU

BOSTON
General Machinery Corp.

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KENT-OWENS MACHINE CO., TOLEDO, OHIO

PRODUCTION FACILITIES *Available Now!*

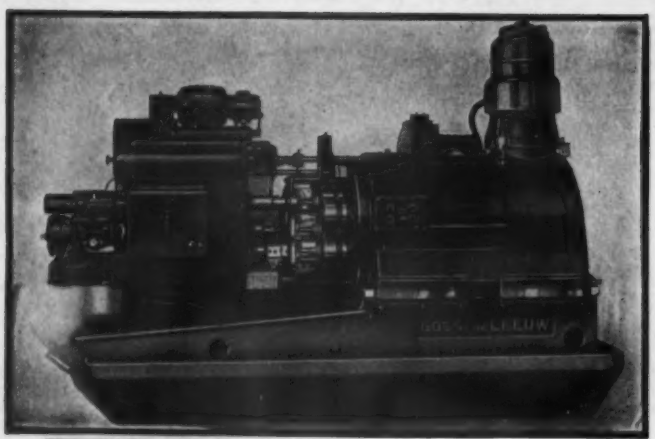
● Subject to prior engagement, this company offers certain facilities of one of the finest equipped machine shops in the Mid-West, for contract production. Some of our government contracts have now been completed, and we are in position to share the output of our equipment of new, modern turret lathes, 3¾" automatics, millers, grinders, boring mills, etc., with other manufacturers now engaged in military or essential civilian production.

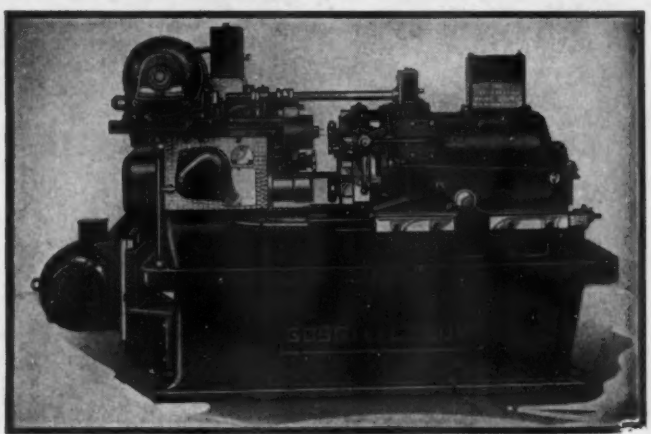
In addition, our engineering and designing division can offer limited services in developing new machines or parts, and in modernizing pre-war models. *Write for literature and explain your problem.*

MERZ *Engineering Company*

INDIANAPOLIS 7, INDIANA

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES





WORK ROTATING TYPE
5 Spindles
6 Spindles
8 Spindles

Features include:

Lead Screw Threading on both types—Preloaded Anti Friction Spindle Bearings—Hardened Ways—Oversize Spindles—Gears of Chrome-nickel steel, carefully heat-treated.

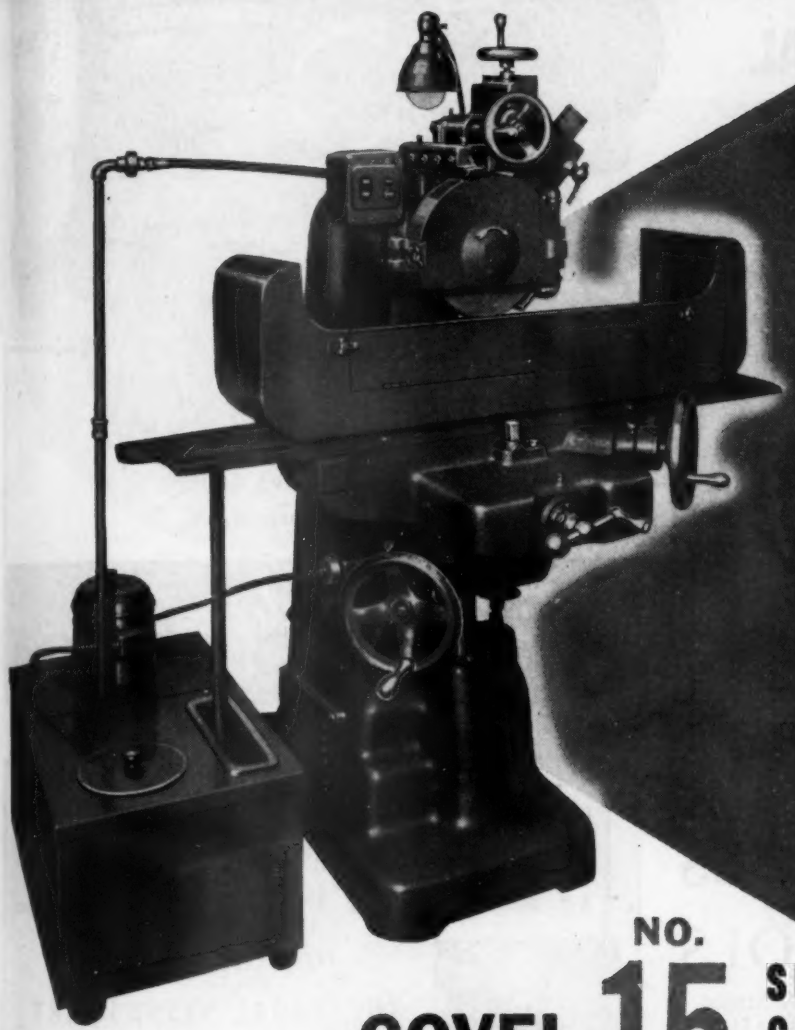
Write for copy of descriptive catalog giving complete, detailed specifications.

TOOL ROTATING TYPE
4 Spindles
5 Chucking Positions

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

CUT WORK SPOILAGE!

Save Valuable Time and Material



- ★ Ball Bearing Spindle—dust-protected.
- ★ 3-Speed V-Belt Drive.
- ★ V and Flat Table Ways.
- ★ Convenient Controls.
- ★ Extra-large Work Table.
- ★ Ample Knee-room for operator's comfort.
- ★ Built-in Wheel Truing Device (optional).
- ★ Wet Grinding Attachment (optional).

COVEL NO. 15 SURFACE GRINDER (6" x 18")

Work spoilage in the finishing stages means a great loss of time, material, and manpower. Safeguard your products. Specify the Covel No. 15 Hand Feed Surface Grinder for precision finish jobs. The wheel on this famous machine *can't* drop into the work. The spindle remains stationary — it's the work that moves UP to the wheel! This feature alone makes the No. 15 indispensable in busy war plants where many workmen have had little experience with grinding machines. Check the additional points above, all designed for efficient, trouble-free operation on fast production schedules.

Write today for Bulletin A-114 and full details.

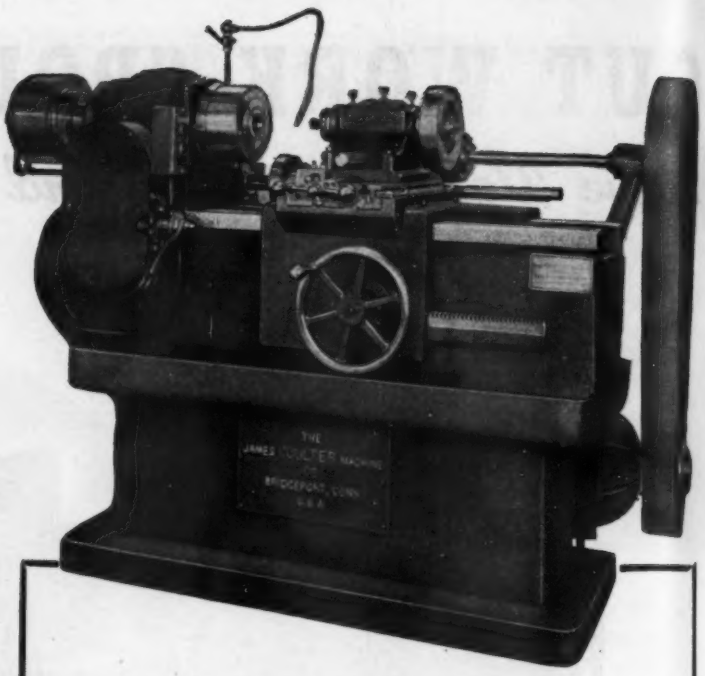
Prompt Delivery to War Industries.

GRINDING MACHINERY SINCE 1874

COVEL INDUSTRIAL GRINDERS

COVEL MFG. CO., BENTON HARBOR, MICHIGAN U. S. A.

Keep Ahead of
DEFENSE DEMANDS
on the PRODUCTION of
EXTERNAL and INTERNAL THREADS



The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.

Send for Descriptive Bulletin giving full information.

The James COULTER *Machine Co.*
BRIDGEPORT • CONNECTICUT • U.S.A.

CRAFTS

Consistent Quality

ARTHUR A. CRAFTS COMPANY, INC.

GAGES AND TOOLS

603 Newbury Street
at Kenmore Sq. BOSTON
DETROIT · CHICAGO

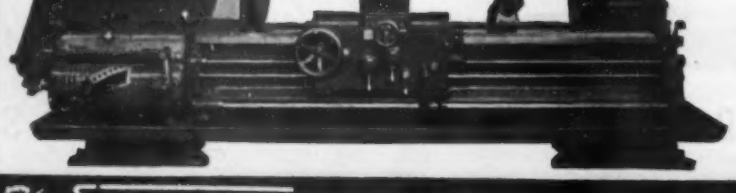
HARDNESS TESTER

Let the SCLEROSCOPE speed up the production of that s so we can blow the Axis to HELL

Write for Circular!

THE SHORE INSTRUMENT & MANUFACTURING CO., INC.
9025 VAN WYCK AVENUE
JAMAICA, NEW YORK
TELEPHONE: JAMAICA 6-4090

SPRINGFIELD GEARED HEAD LATHES



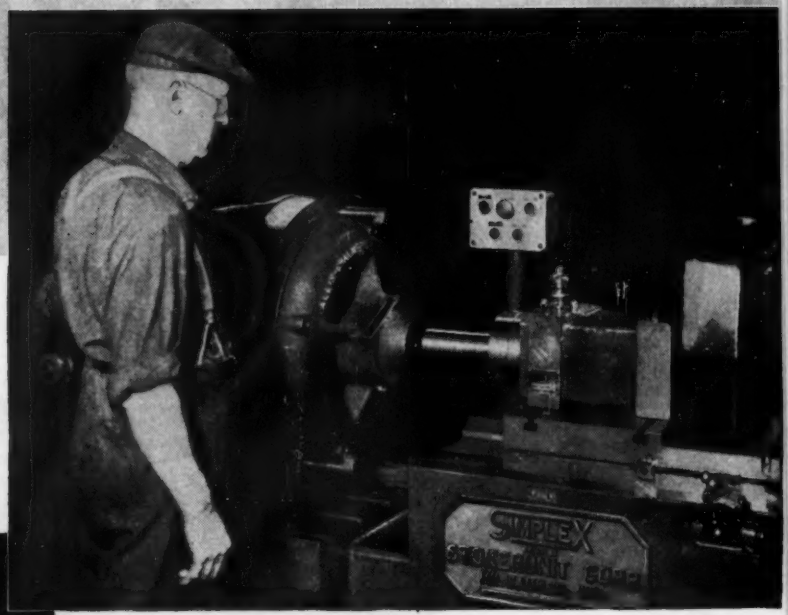
for peacetime or war production!

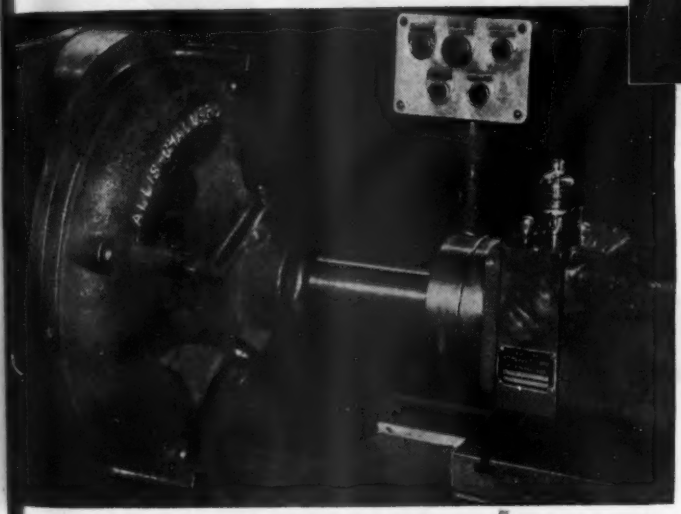
A lathe purchased now, for round-the-clock war production, must still meet peacetime requirements. Therefore, specify SPRINGFIELD lathes —flexible, efficient, ideal for emergency or normal production. SPRINGFIELD lathes are built in sizes from 14" to 30". Write for descriptive bulletins, prices, deliveries, etc.

The SPRINGFIELD MACHINE TOOL COMPANY • • • SPRINGFIELD, OHIO, U.S.A.

Motor End Shield Bearing Seats Precision Bored on

STOKERUNIT SIMPLEX *Precision* BORING MACHINE





Finish Boring Time 2 Minutes for Both Seats . . . Total Boring Length—2¾"

The two bearing seats in the end shield of this electric motor are precision bored on a No. 2U Stokerunit Simplex Single-Spindle Precision Boring Machine. Both are identical in diameter—3.6875". Length of bore on first seat is 1½", on the second 1¼". As they are spaced 4⅛" apart, a total spindle travel of more than 6⅞" is necessary to complete the boring operation.

The total boring time of only 2 minutes for both bearing seats is made possible by rapid traverse of the Stokerunit Simplex spindle unit, which automatically provides quick approach to cutting position at each seat and quick return at end of machining cycle.

Additional Boring Data: Spindle speed 400 r.p.m.; feed 1⅜" per min. Tolerance on finish bore is −.001"; high finish is produced. Material is cast iron. Tungsten carbide cutters are used.

The face plate type locating fixture has multiple locating rabbets for holding various sizes of end shields. This fixture is also equipped with an adapter for holding various sizes of ball bearing cages up to 6" in diameter while boring the ball bearing seats.

Profit with Stokerunit Versatility . . .

Over 25 versatile models of Stokerunit Simplex Precision Boring Machines are available to solve *your* precision boring problems. They cover practically the entire range of precision boring applications and can be furnished in mechanical and hydraulic feeds, with single or multiple spindles, for either short-run or production work.

For specific recommendations, send blueprints of parts with production requirements. No obligation.

Write Today for these two booklets covering details of our entire line of Simplex Precision Boring Machines.

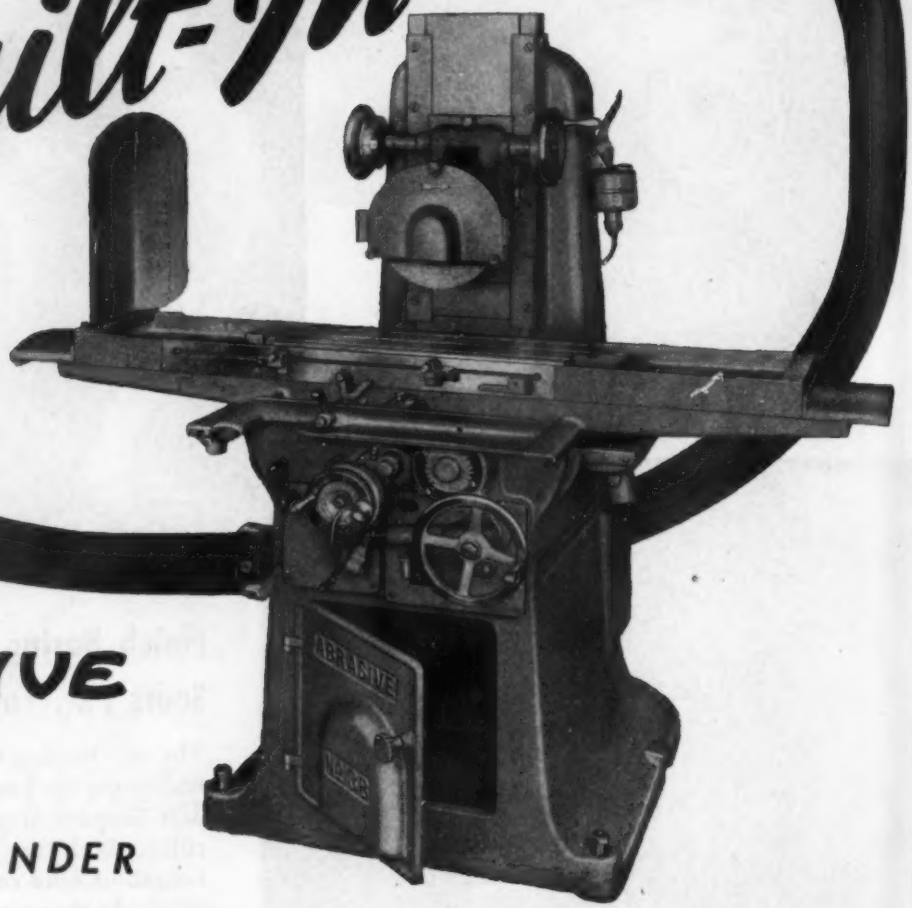
STOKERUNIT CORPORATION

DESIGNERS AND BUILDERS OF PRECISION BORING MACHINES AND MILLING MACHINES

4524 WEST MITCHELL STREET · MILWAUKEE 14, WISCONSIN

ACCURACY & DEPENDABILITY

"Built-In"



ABRASIVE 3-B SURFACE GRINDER

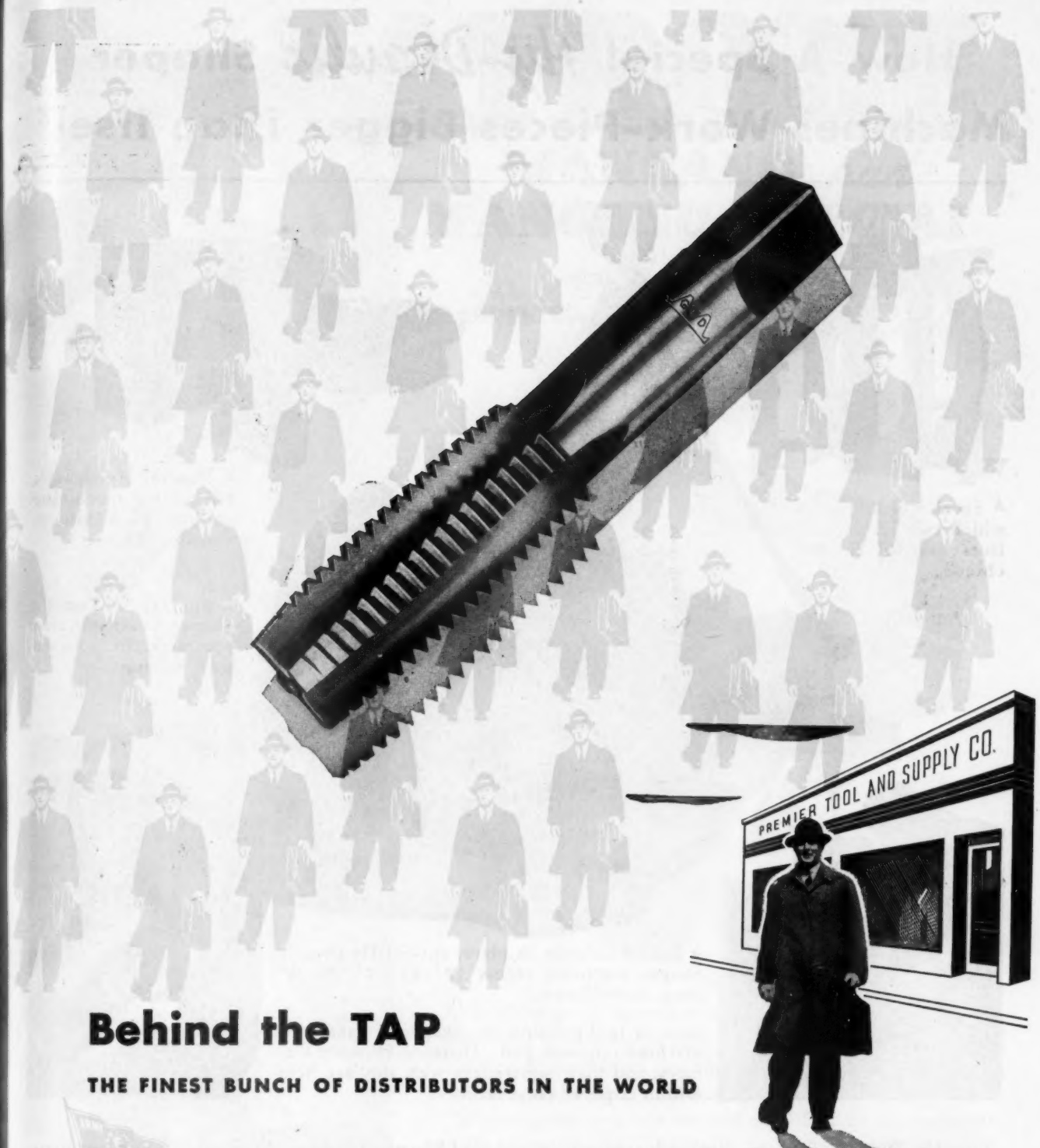
In excellence of design, workmanship, and materials of construction, the ABRASIVE 3-B is "tops" in surface grinders. To insure perfect alignment and freedom from distortion the bed of this machine is a massive one-piece casting weighing over 1500 lbs. Typical of ABRASIVE quality, the precision spindle of alloy steel, hardened, ground and lapped, is carried in a phosphor bronze box at front, adjustable for wear, and super-precision ball bearings at rear. For accuracy and dependability, specify ABRASIVE 3-B.

ABRASIVE

ACCURACY BOOSTS PRODUCTION

SEND FOR DESCRIPTIVE BULLETINS

ABRASIVE MACHINE TOOL COMPANY, EAST PROVIDENCE 14, R I. • *Dealers in Principal Cities*



Behind the TAP

THE FINEST BUNCH OF DISTRIBUTORS IN THE WORLD

Yes, you get more than a fine tap when you specify "Greenfield"— and one of the most important *plus values* you receive is the "on the spot" service of Greenfield Distributors. Your local "Greenfield" Distributor carries a complete stock. He can be at your side in a few minutes. In nearly every industrial center in America you will find that the leading small tool supplier is a member of the nation-wide "Greenfield" distributing organization, devoted to helping you solve your production problems.

Yours For Better Threading

GTD GREENFIELD

AGES APS IES

GREENFIELD TAP AND DIE CORPORATION
GREENFIELD, MASSACHUSETTS

How A Special *Hy-Draulic* Shaper Machines Work-Pieces Bigger Than Itself

▲ Steel weldment in which two inside surfaces are to be machined.

▲ Special Hy-Draulic Shaper for machining surfaces in weldment shown at left.

◀ Special Hy-Draulic Shaper is easily located accurately in position on weldment.

◀ Bolted securely in place; special Hy-Draulic Shaper machines recess 12" by 12", by ½" deep, in weldment.

Second tool-position on Shaper is used to ▶ machine opposite pad. Distance between surfaces, and their squareness with top, are held within required close limits.

4403

The Hy-Draulic features and advantages in this single-purpose Shaper make its purchase a highly profitable investment. This machine demonstrates one of many possibilities for applying Hy-Draulic Shapers, Planers, Slotters and Shaper-Planers effectively to current production in single-purpose, semi-standard and standard types. Investigate, *today*. See what Hy-Draulic Machine Tools can do for you. Please address inquiries to Department 1510.

ROCKFORD MACHINE TOOL CO., ROCKFORD, ILLINOIS

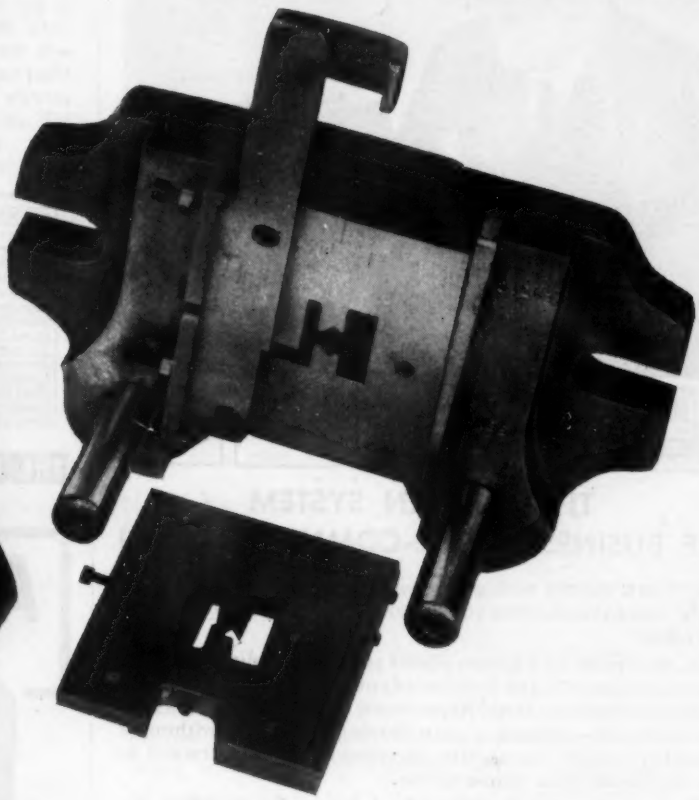
LATROBE

MANGANO *and* MANGANO SPECIAL

OIL HARDENING *Die Steels*

ACCURATE SHAPES
EASILY FORMED

WITH
PUNCHES AND DIES
MADE OF LATROBE
OIL-HARDENING STEEL



FOR THIS
COMMUTATOR

THE illustrations show one of many jobs involving the production of component parts vital to our war machines. This type of work often demands the use of oil-hardening tool steel with assured minimum distortion.

In such cases, you can depend upon Latrobe Mangano or Mangano Special Die Steels. Write for information.

TYPICAL ANALYSIS

	C	Si	Mn	Cr	W
Mangano	.95	.30	1.65	.20	—
Mangano Spec'l	93	.30	1.20	.50	.50

LESCO

3

Latrobe ELECTRIC STEEL COMPANY

MAIN OFFICES *and* PLANT · · LATROBE · PENNSYLVANIA

Shift your Business into High Gear

WITH

EXECUTONE

THE MODERN SYSTEM OF BUSINESS INTER-COMMUNICATION

WORK FLOWS with greater smoothness—*greater speed*—from the moment you install EXECUTONE in your plant or office.

A mere press of a button places you in immediate voice-to-voice contact with any member of your organization—or with *several* at the same time! Reports are made—questions asked or answered—without a man leaving his desk, without a moment wasted. It's as easy, convenient and as personal as an across-the-desk conversation.

No more running back and forth from office to office. No more time-consuming delays while phones and buzzers go unanswered. EXECUTONE injects the split-second speed of electronics into inter-office communication . . . relieves your switchboard of "inside" traffic . . . quickens the pace and pulse of your whole business!

The U. S. Navy has selected EXECUTONE as the "inter-com" system for many of our fighting ships. It will take only a few minutes to show you EXECUTONE in your own place of business. No obligation to you.

SEND FOR BOOKLET TODAY—
USE THIS CONVENIENT COUPON

Executone INC.

415 Lexington Ave., New York 17, N.Y.

Please send me your Free Booklet "G11" on solving inter-communication problems

FIRM NAME.....

ADDRESS.....

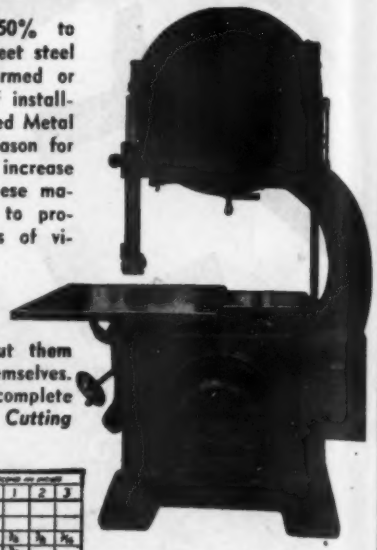
BY.....TITLE.....

For the Future of your Company and your Employees—BUY WAR BONDS!

SAW IT • IT'S FASTER!

WITH Tannewitz METAL CUTTING BAND SAWS

Production increases of 50% to 100% in the cutting of sheet steel and non-ferrous metals—formed or flat—is the usual result of installing TANNEWITZ High Speed Metal Cutting Band Saws. The reason for this phenomenal production increase is due to the fact that these machines are precision built to provide better than two miles of vibrationless sawblade travel per minute and hence slide through the work with the greatest of ease. Many patented features put them entirely in a class by themselves. It'll pay you to get the complete facts. *Just ask for Metal Cutting Band Saw bulletin.*



KIND OF MATERIAL	Thickness and feed per second in inches							
	1/32	1/16	1/8	1/4	1	2	3
Mild Steel	32-24	6	3	1			
Stainless Steel	6	2	1	-			
Yellow Brass, Zinc	24	12	6	3	1½	¾	⅜
Bronze or Copper	6	3	1½	¾	⅜	⅜	
Aluminum	24-36	18	9	4½	2	1¼	½
Duraluminum	24	12	6	3	1½	¾	⅜
Single Pattern				6	4		
Double Pattern				4	3		
Plywood	24-36	24	20	16	12	6	3	1½
Asbestos Board	12	6	3	1½	¾			
Fibre (Hard)	24	12	6	3				
Paper Board	24	18	12	4	2	1		
Masonite	24	16	12	6	3	1½	¾	⅜
Bakelite	12	6	3	1½	¾	⅜	3/16	

Other bulletins worth writing for: "SINGLE AND VARIABLE SPEED BAND SAWS FOR FOUNDRY USE"; "BAND SAWS FOR DIE-SAWING"; "INSIDE AND OUTSIDE FILING AND POLISHING".

THE TANNEWITZ WORKS, GRAND RAPIDS, MICH

Almond Drill Chuck

. . for over 70 years

ALMOND THREE-JAW DRILL CHUCKS—the first to be placed on the market more than seventy years ago—pioneered the field of drill chucks. During all these many years, ALMOND CHUCKS have continued to be a necessary part in the logical procedure of machine developments.

Made in types and sizes to fit all machine tools and portable drills.

Write for further information.

The Original Manufacturers of Drill Chucks

T. R. ALMOND MFG. CO.

Ashburnham, Mass., U.S.A.

HOW MUCH LESS PAPER CAN YOU USE IN YOUR PLANT?

That's a mighty important question. Paper stocks are seriously low this year, and every time another shipload of paper-wrapped war supplies leaves an American port, the problem gets tougher • The voluntary cuts, the simple economies you have put into operation up to now, won't be half enough in 1944 • The only answer is honest, convincing *paper-pinching* by every one who uses paper • Organize a Paper Conservation Committee in your company. Pick only the best men for this job, and give them a green light so that they can work effectively • From envelopes to heavy cartons, have this Committee see to it that functional packaging is the order of the day—every day • In the panel are suggested many ways your plant can use less paper. But you know your own business best! Go to it *NOW!*

Use Less Paper Because

Multiwall paper bags are used extensively in shipping flour and dehydrated foods.

All openings and exposed surfaces of tanks are sealed with paper for shipping.

Submachine guns are not only paper-wrapped but boxed in paper board. Shell grommets, bomb rings and practice bomb fins are made of paper to save needed steel.

Gas-mask canisters and hand-grenade containers are made of paper.

Paper is used in camouflage strips and netting and parachutes.

All Army clothing and equipment are shipped in waterproof paper wrappers.

Use Less Paper These Ways

Condense letters and memoranda by (a) keeping margins as narrow as possible; (b) sticking to single-space forms; (c) using reverse side of incoming letters as first carbon copy of replies; (d) using reverse side of second sheets for carbon copies; (e) using bath sides of all mimeographed sheets.

Check carefully to determine whether your shipping container exceeds the requirements of Rule 41 of "consolidated freight classification requirements."

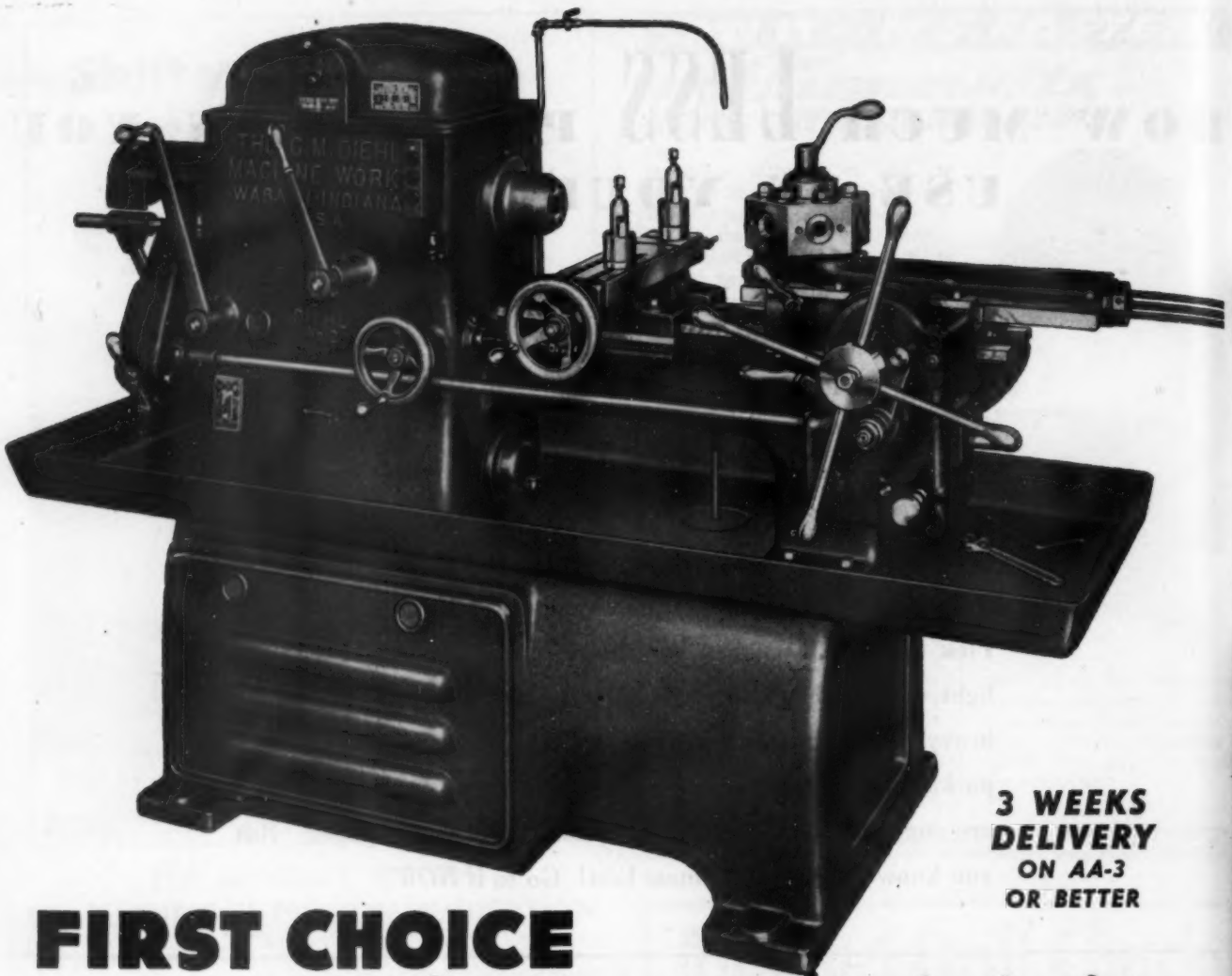
Eliminate individual cartons in every practical instance. When individual cartons are indispensable, pack in bulk whenever possible.

Control disbursement of paper supplies to employees so that excessive quantities do not accumulate in desks and departmental supply closets.

This advertisement prepared under the auspices of the War Advertising Council in co-operation with the Office of War Information and the War Production Board.

LET'S ALL USE LESS PAPER

Space for this advertisement contributed by AMERICAN MACHINIST



3 WEEKS DELIVERY ON AA-3 OR BETTER

FIRST CHOICE *in many plants today*

The Diehl No. 2 Turret Lathe is designed to meet the demands for an economical lathe capable of turning out accurate work to exacting specifications. That's why it is first choice in many manufacturing plants today.

Embodying the most advanced developments, the Diehl Lathe is unsurpassed for sustained, high speed, precision performance. It works alongside other No. 2 lathes of standard make, using same tooling, including collets.

For long years of economical service, vibration-free operation with ample power to provide for extreme production requirements, you can't beat Diehl. Write today for complete specifications and illustrated brochure.

Automatic chuck capacity (round)	*1″*
Swing-over cross slide	*6″*
Swing-over bed	*14″*
Six speeds	*forward and reverse.*

WRITE FOR COMPLETE SPECIFICATIONS AND ILLUSTRATED BROCHURE ★ ★ ★

The G. M. **DIEHL** *Machine Works, Inc.*

WABASH, INDIANA

Where precision craftmanship is honored

"I thought my eyes were playing tricks on me"

"We used to pat ourselves on the back when we could take off .005" at a clip on high speed tools but Por-os-way removes .020" at a pass and holds its corner. In fact, out of curiosity, we deepened the cut to .050" without injury to wheel or work. I could hardly believe my eyes." Many operators try this wheel, get greater production, then fail to drive for more. Never be complacent about Por-os-way. Never stop trying to beat old production marks until you've pushed this wheel to the limit on depth of cut and rate of feed. Write for the Por-os-way booklet and really give Por-os-way a going-over on trial!

IT'S THE **2-IN-1 WHEEL**

Here's time-saving news for you! Deepen the cut and try the same Por-os-way wheel you select for a precision finish on your rough grinding operations. Many plants find the same wheel does both jobs—saving time wasted in wheel changes and extra finish passes.

The List of Por-os-way Users Reads Like a Blue Book of American Industry, Included are:

E. C. Atkins & Company • Bell Aircraft • Edward G. Budd Mfg. Co. • Buick Motor Division of General Motors • Kinner Motors, Inc. • Studebaker Corporation • Thompson Aircraft Products • Wadell Engineering Co. • Westinghouse Electric Wright Aeronautical

DON'T UNDERESTIMATE CHIP CLEARANCE

Cutting tools, such as a twist drill, require clearance so that material can be removed without interference. Por-os-way's unique, very porous structure provides chip clearance naturally. Fewer dressings and close examination of Por-os-way chips will quickly demonstrate that to you. It is one other of the Por-os-way advantages!

THIS MAKES THE DIFFERENCE

You can spot the difference between an ordinary wheel (bottom) and a Por-os-way wheel (top) with the naked eye. The extra porosity of Por-os-way is the reason for more than 8 distinct operating advantages.

2 TO 5 TIMES MORE PRODUCTION PER MAN PER MACHINE

RADIAC*

POR-OS-WAY*

*T. M. Reg. U. S. Pat. Off. Copyright, 1944 A. P. de Sanno & Son, Inc

A. P. DE SANNO & SON, INC., 430 Wheatland St., Phoenixville, Pa., Since 1893

NEW YORK, PITTSBURGH, CLEVELAND, DETROIT, CHICAGO, LOS ANGELES

Radiac POR-OS-WAY • Radiac PARAFLEX • Radiac Mounted Points and Mounted Wheels Radiac Internal Grinding Wheels • Radiac Abrasive Cut-Off Machines and Discs

RADIAC*

MOUNTED POINTS, MOUNTED WHEELS AND INTERNAL GRINDING WHEELS

[*Right* for the job! They *stay right* because they're prescription-fitted and custom-compounded.]

No question about getting the right Radiac wheel for your job. Each Radiac wheel is "prescription-fitted" for your purpose and custom-compounded. Each "prescription" is carefully recorded so that repeat orders can be exactly duplicated. Radiac is right... and right every time! Write for booklet with complete details on Internal Grinding Wheels (booklet #1) and Mounted Points (booklet #2).

RADIAC MOUNTED POINTS & MOUNTED WHEELS

All wheels and points are dressed and finished ready to use (no finishing, by you necessary). · All kiln glaze is removed. · All are 100% tested to precision tolerances · Concentricity is guaranteed · Special Bakelite cement secures wheel to mandrels · Radiac Mounted Points and Mounted Wheels are available in tough, regular aluminum oxide (brown) or in special aluminum oxide (white or red bond) for greater friability.

RADIAC INTERNAL GRINDING WHEELS

All wheels are 100% tested to precision tolerances. · Every wheel is a product of pioneers in the development of internal grinding wheels. · Radiac Internal Grinding Wheels are available in tough, regular aluminum oxide (brown); in special, aluminum oxide (white or red bond) or a special exclusive "Blue Glass" friable bond which permits an increase in the ratio of cutting grain to bond.

PIONEERS in the development of mounted points, mounted wheels, and internal grinding wheels.

Radiac POR-OS-WAY— Radiac PARAFLEX —Radiac Mounted Points and Mounted Wheels — Radiac Internal Grinding Wheels — Radiac Abrasive Cut-Off Machines and Discs.

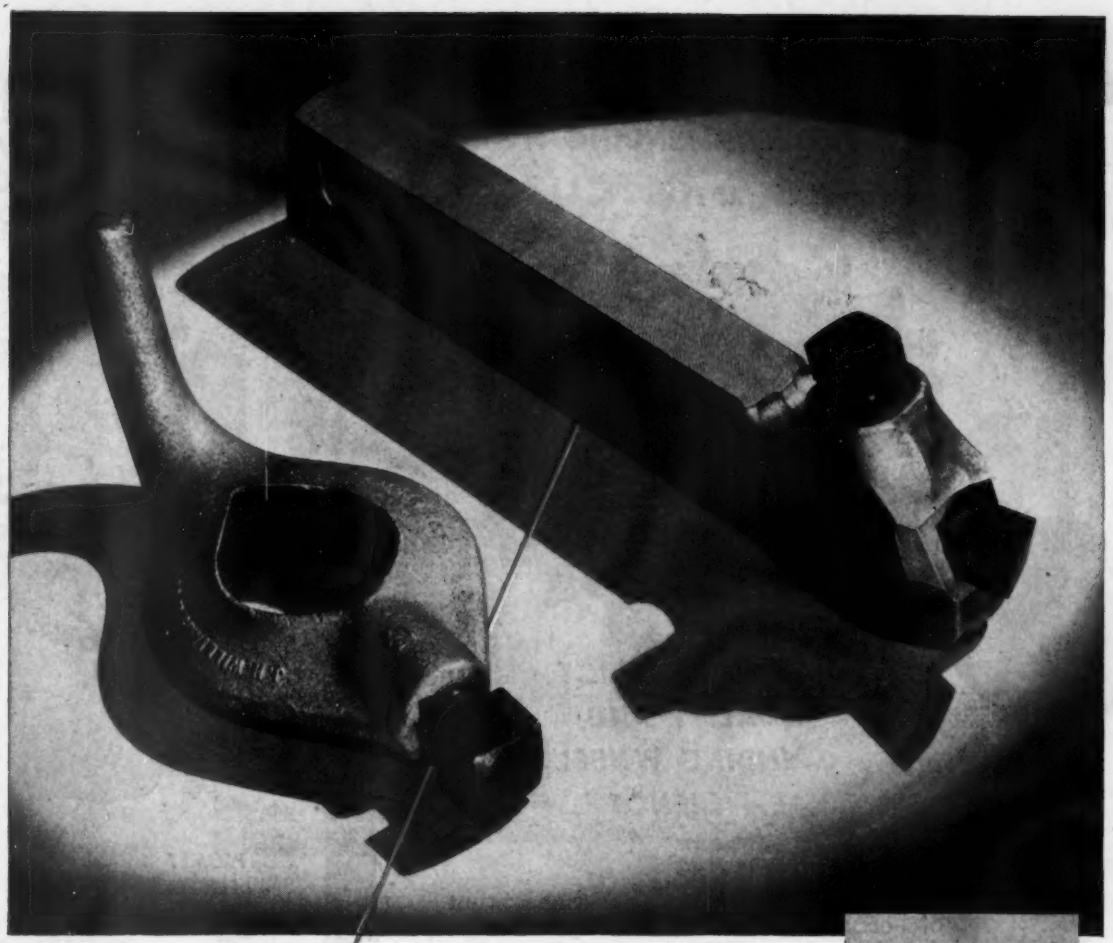
For Fast Stock Removal, Long Life, Cool Cutting-

RADIAC

A. P. DE SANNO & SON, INC., 430 Wheatland Street, Phoenixville, Penna., Since 1893

*T. M. Reg. U. S. Pat. Off.

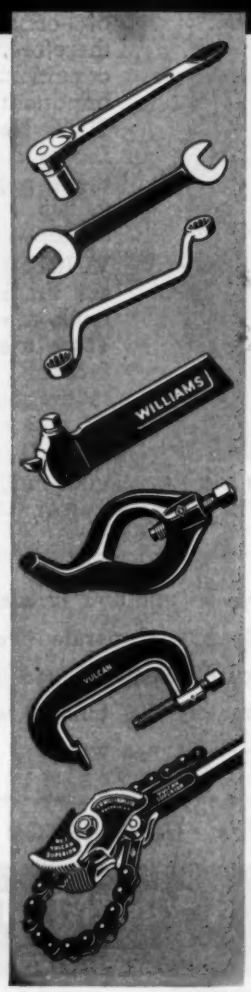
NEW YORK · PITTSBURGH · CLEVELAND · DETROIT · CHICAGO · LOS ANGELES



Seed for Victory

TOOLS BUILD MACHINES . . . men and machines win modern wars . . . That the Allied Nations may have machines superior to the enemy's, we build better with better tools . . . Fine tools, like Williams', in the hands of free and willing labor, are indeed the seed for Victory.

J. H. Williams & Co.,
Buffalo 7, New York.

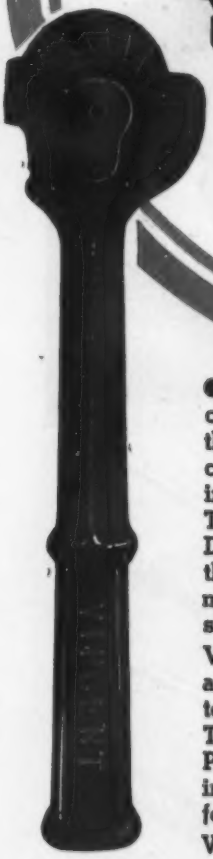


WILLIAMS
DROP-FORGINGS AND DROP-FORGED TOOLS

VINCENT-HUNTINGTON

NEW IMPROVED GRINDING WHEEL DRESSERS and CUTTERS

INSURE PRODUCT QUALITY AND GRINDING WHEEL EFFICIENCY



HOODED TYPE

REGULAR TYPE

● Grinding Wheels must bear the brunt of constant, 24-hour-a-day production, therefore, they MUST be kept in perfect condition. The proper equipment for this important work is VINCENT-HUNTINGTON New Improved Grinding Wheel Dressers and Cutters . . . to dress them regularly to remove impregnated metals . . . to true them regularly to square off face and remove nicks.

VINCENT-HUNTINGTON Cutters, which are the most important part of dressing tools, are made of high carbon tool steel. They are heat treated by the "Vincent Process" which gives them the ultimate in toughness and hardness so important for this work.

When ordering grinding wheel tools from your mill supply distributor insist on "Vincent."

★ In addition to making Grinding Wheel Dressers and Cutters, we operate two of the largest production heat-treating plants in the United States. These two plants turn out approximately 300 tons of war work daily, working 24 hours a day —7 days a week.

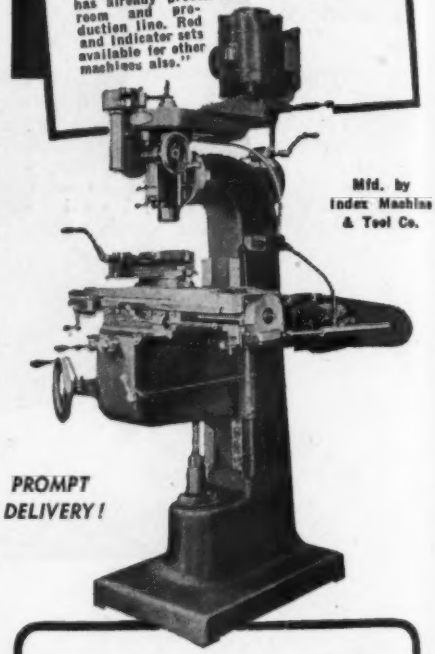
"If it's a HUNTINGTON Dresser or Cutter ... VINCENT MAKES IT"

THE VINCENT STEEL PROCESS CO. 2434 Bellevue Avenue DETROIT, MICHIGAN

NOW! INDEX MILLS

EQUIPPED WITH RODS & INDICATORS

"We are pleased to announce a rod and indicator set available for installation on Index Mills, either new at the factory, or used machines already in the field. Set consists of two indicators graduated in .0001" two micrometer heads graduated in .0001", necessary precision rods for locating in an area 8" x 16", and troughs for holding rods cross and longitudinal. This makes it possible for you to obtain, at an astonishingly low price, a precision locater as well as a vertical mill which has already proven its merits in the tool room and production line. Rod and Indicator sets available for other machines also."



Mfd. by Index Machine & Tool Co.

PROMPT DELIVERY!

12" Tool Room Rotary Table

Mfd. by Index Machine & Tool Co.

A quality tool for precision work in the tool room or production line, incorporating such features as ball bearings—hardened and ground worm—quick acting throw-out for free hand turning—single movement table lock that does not cramp table out of alignment—compound trough. 12" size only.

For use on Index Mills or any other machine that will accommodate a 12" table.

BLANK and BUXTON MACHINERY

3100 E. MICHIGAN AVE.
JACKSON, MICH.

FAST · ACCURATE · RUGGED

"Quality" Adjustable Limit Snap Gages

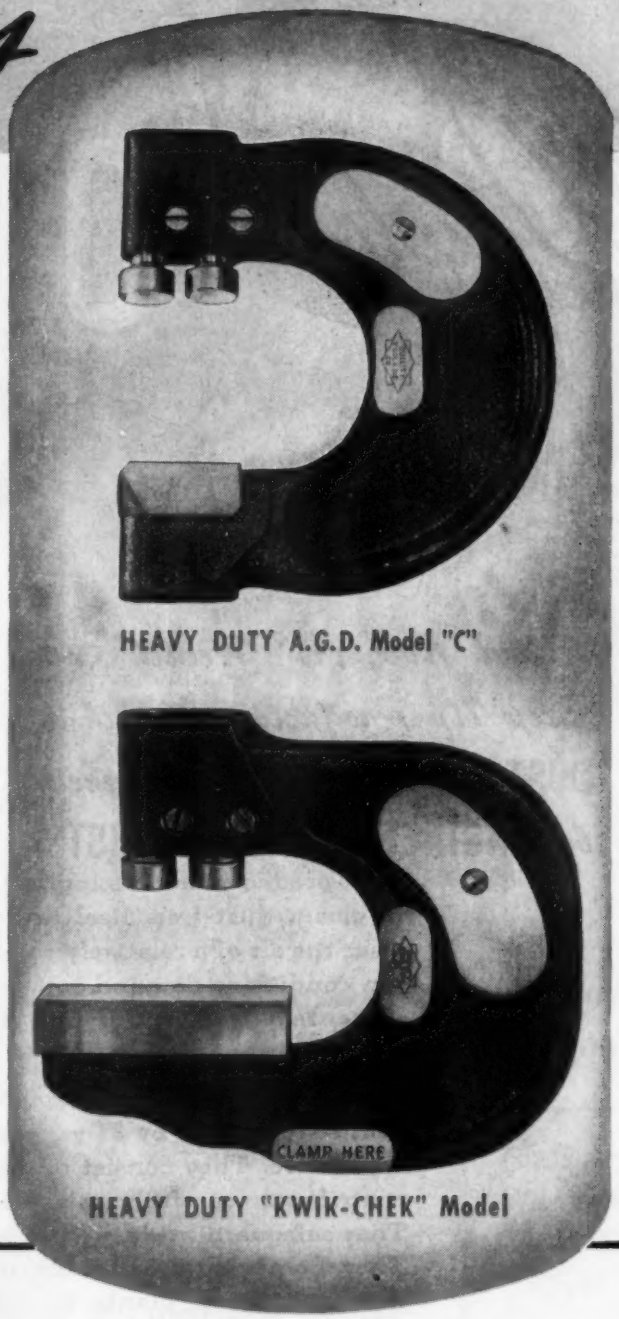
HEAVY DUTY A.G.D. MODEL "C"

Acclaimed for its ability to maintain accuracy even with hard usage. The contact anvils and gaging buttons are of hardened and tempered tool steel, ground, lapped and adjusted to size. They are held in place by an A.G.D. Locking Device. Assures quick and accurate inspection of duplicate parts. Round or square head buttons optional.

Write for Illustrated Price List

HEAVY DUTY "KWIK-CHEK" MODEL

Ideal for ease and speed in gaging odd or irregular-shaped pieces. Note the lower anvil extending beyond back edge of top gaging button for aid in gaging counter-bored work, and in lining up work before presenting it to the gaging anvils. An excellent gage for checking end measurements of any kind.



HEAVY DUTY A.G.D. Model "C"

HEAVY DUTY "KWIK-CHEK" Model

ARMY NAVY

SPEED VICTORY

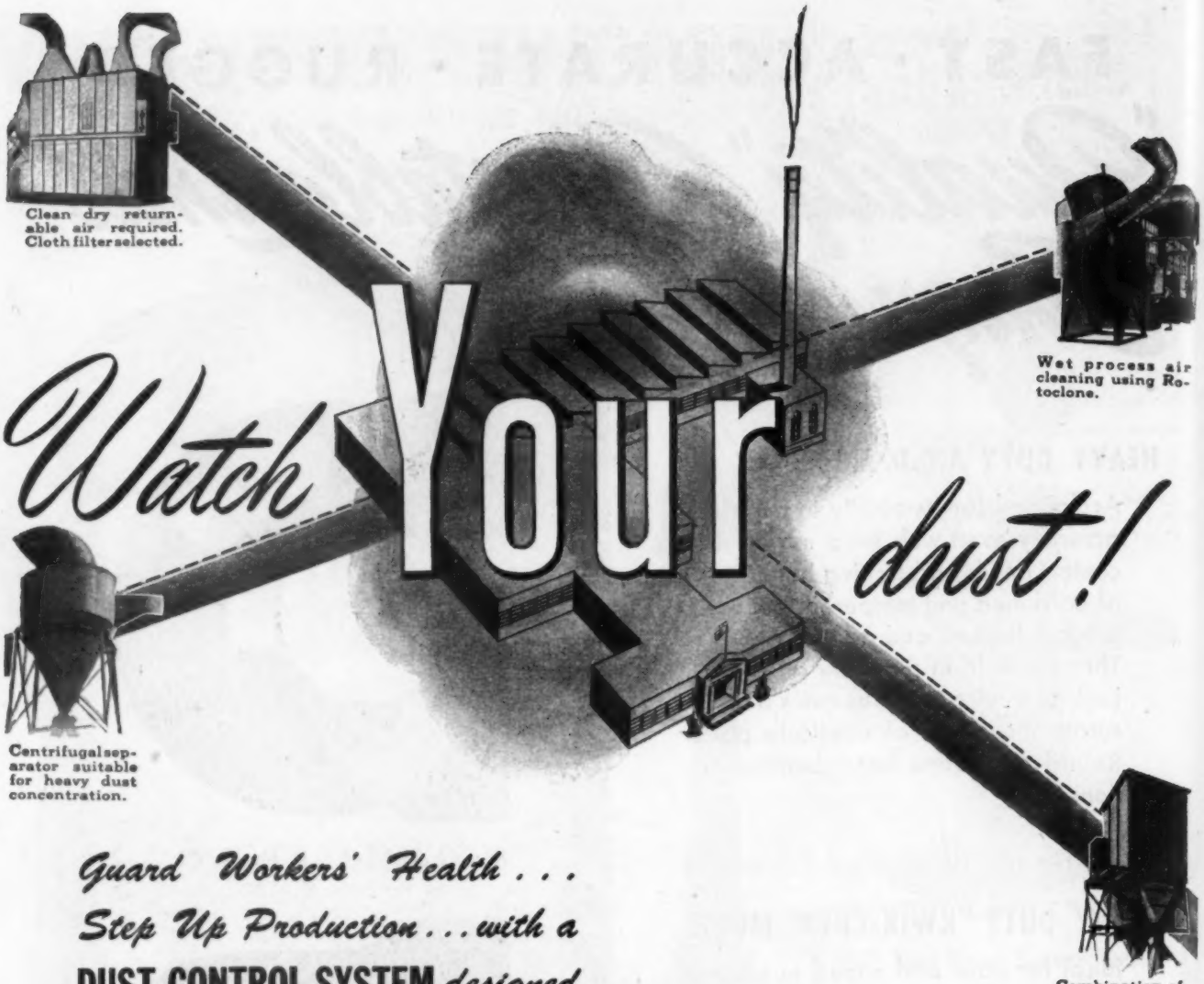
★

BUY WAR BONDS

QUALITY TOOL & DIE CO.

Manufacturers of "Quality Products"

407 N. NOBLE STREET • INDIANAPOLIS 2, INDIANA


Clean dry returnable air required. Cloth filter selected.
Wet process air cleaning using Rotoclone.
Centrifugal separator suitable for heavy dust concentration.
Combination of centrifugal separator and dry filter.

Watch Your dust!

Guard Workers' Health . . . Step Up Production . . . with a DUST CONTROL SYSTEM *designed by* ENGINEERING SPECIALISTS

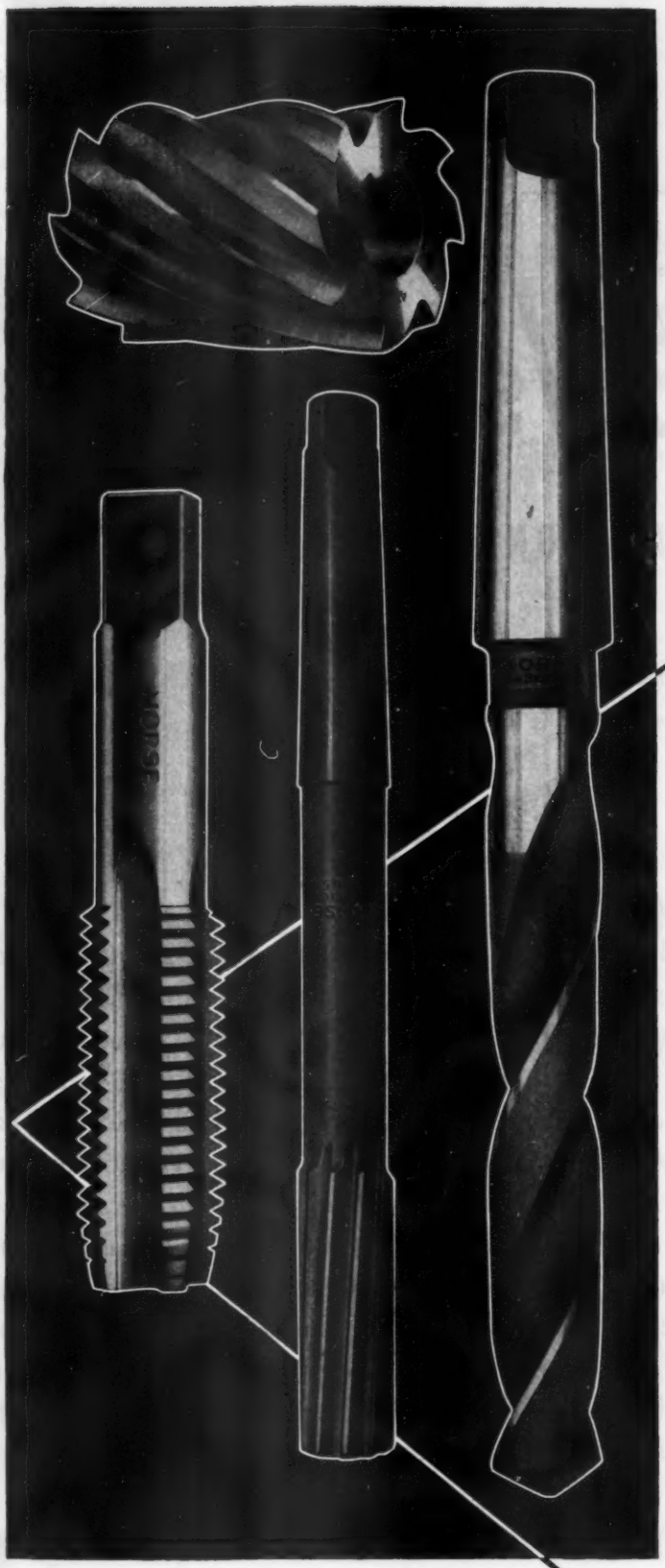
MANPOWER is at its best, production at its highest, when work is performed in clean, dust-free, healthful air. It is not enough to clear the air of a relatively small amount of dust . . . modern conditions demand removal of the highest possible percentage of harmful dust by a really efficient dust control system.

Dust control systems designed and installed by Kirk & Blum are backed by 37 years of specialized engineering experience. They consist of the *right* units, wet, dry or centrifugal, carefully selected for the individual job. They safeguard workers' health, speed output, cut costs. They help maintain maximum production during the war, and equip plants to take utmost advantage of post-war opportunities.

KIRK AND BLUM

AN ORGANIZATION OF ENGINEERS AND MECHANICS

THE KIRK & BLUM MANUFACTURING CO., 2823 SPRING GROVE AVE., CINCINNATI 25, OHIO



PRODUCTION STRATEGY

• *It is good strategy* to use good cutting tools. The quality of your cutting tools measures the efficiency of your machine tools!

Tools Are Weapons Treat 'Em Right

MORSE THERE *IS* A DIFFERENCE

TWIST DRILL AND MACHINE COMPANY
NEW BEDFORD, MASS., U. S. A.

NEW YORK STORE: 130 LAFAYETTE ST. - - - - CHICAGO STORE: 570 WEST RANDOLPH ST.

DESIGNED TO DO A BETTER WAR JOB

THE NEW NO. 277 SAFETY WHEELS

FOR NATIONAL EMERGENCY STEELS

NOW there is a grinding wheel designed specifically for centerless and cylindrical precision grinding of National Emergency Steels. It is the No. 277 Safety Wheel . . . with a NEW BOND that guarantees faster grinding—improved cutting action—better finish. Breaking and chipping has been reduced to a minimum—latitude of operations increased. Efficiency, economy, and production reach new high levels. And more and better war weapons flow to our fighting forces overseas. No. 277 wheels are made in almost every conceivable size, shape, grit, porosity, and grade of hardness. Whatever your grinding requirements —there is a specific No. 277 Safety Wheel to do the job. Write today for illustrated folder and full details.

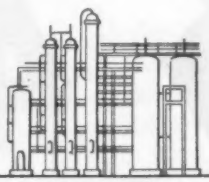
THE SAFETY GRINDING WHEEL AND MACHINE COMPANY

Main Office and Factory SPRINGFIELD, OHIO, Phone 4651

● Birmingham—3-3323 ★ Chicago—TRiangle 8308 ★ Cleveland—EXpress 1445 ★ Detroit—TOwnsend 8-4740
☆ Pittsburgh—COurt 2822 ★ Erie—23-093 ★ Philadelphia—WAlnut 3132 ★ St. Louis—CEntral 3676
★ Syracuse—3-2131 ● Milwaukee—BLuemound 0742
● SALES OFFICE ★ SALES OFFICE and WAREHOUSE

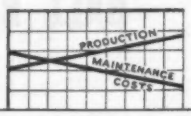
GULF INDUSTRIAL LUBRICATION

This emblem stands for:



Quality industrial petroleum products

Trained and experienced Service Engineers



Effective help on many plant problems

IN EVERY INDUSTRY, Gulf has studied the manufacturing processes and equipment and has developed the proper petroleum product for each specific requirement.

Trained and experienced service engineers from Gulf's large staff know just how these products should be applied—and with a thorough knowledge of related mechanical and operating problems, they are rendering effective aid to thousands of industrial plants, mines, quarries, and construction projects.

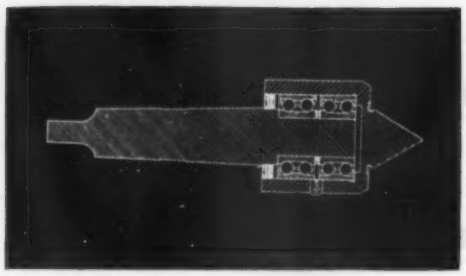
Increased production, longer bearing and tool life, improved quenching practice, better finishes on machined parts, improved rust prevention, lower maintenance costs—these are some of the results industry is obtaining by adopting the practical recommendations and suggestions of Gulf Service Engineers.

If *you* have a problem that in any way involves the use of a petroleum product, Gulf Industrial Lubrication offers *real help.* Let us hear from you.

GULF OIL CORPORATION · GULF REFINING COMPANY

GULF BUILDING, PITTSBURGH 30, PA.

PRECISION ALIGNMENT...



4

ROWS OF PRECISION BALL BEARINGS

QUADRO Precision LIVE CENTERS will outlast old-fashioned solid centers to pay for themselves quickly. They combine the rigidity of the solid lathe center with the frictionless properties of the ball-bearing to form a tool which will increase production without sacrificing accuracy. Manufactured in all tapers and sizes.

Write for Circular.

DAKON
TOOL AND MACHINE CO., INC.
938 BROADWAY NEW YORK 3, N. Y.

QUADRO *Precision* LIVE CENTERS

DALZEN THREAD GRINDER, No. 5, WITH GUARDS REMOVED

IN THREAD GRINDING . . . THE *DRESSER'S* THE THING!

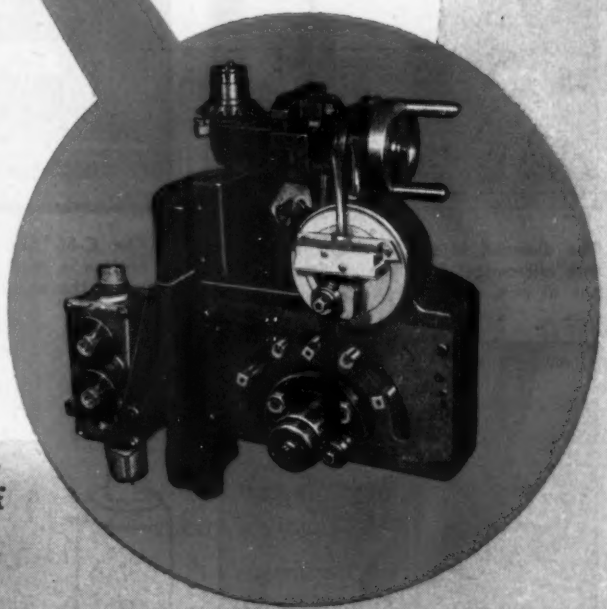
AUTOMATIC DRESSING IS PROVIDED IN THIS *New* DALZEN *Electronic* THREAD GRINDER

● Accuracy of a ground thread depends upon the accuracy of the dressed wheel. Precision, finish and production efficiency in thread grinding are determined primarily by the dresser.

DALZEN engineers always have recognized this fact. Now . . . the new DALZEN Electronic Thread Grinder presents the latest and best in dresser efficiency—offering new and special advantages in dressing performance.

The new DALZEN Thread Grinder with General Electric Thy-mo-trol drive provides maximum production of threaded parts, thread gages, straight and spiral fluted taps, and thread milling cutters. Grinding speed—both wheel and work—forward and reverse—is adjusted by the twist of a dial. Variation is infinite and stepless. It's an investment in *better* thread grinding, and a *low-cost* investment at that!

An attractive three-color folder describing the new DALZEN Models 5 and 6 will be sent you, free of charge, on request.



DALZEN

TOOL & MANUFACTURING COMPANY

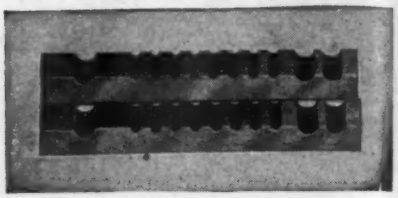
12255 EAST EIGHT MILE ROAD • DETROIT (5), MICH.

DRESSING IS SIMPLIFIED . . . by the New Time-Saving C-66 . . . RADIUS DRESSER FOR SURFACE GRINDERS

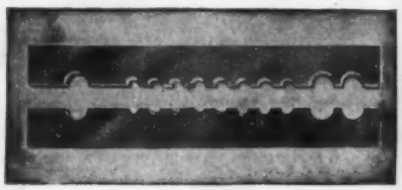
This low-priced, rugged attachment, for any make of surface grinder, dresses wheel without dismantling machine. Mounts directly on magnetic chuck. Does a one-hour job in 10 minutes — accurately — conveniently.

NOTE how this Radius Dresser and two High Speed Tool bits replace an expensive Jig Boring Machine.

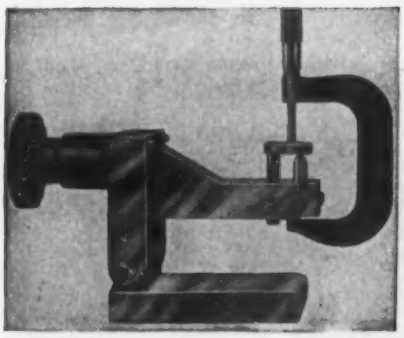
Drill Jig made with two high speed tool bits ground together on surface grinder, eight .062 holes, two screw holes, one dowel pin-hole. No drill bushings, no lapping, no hardening. Grinding time two hours fifteen minutes. Simple, easy, quick.



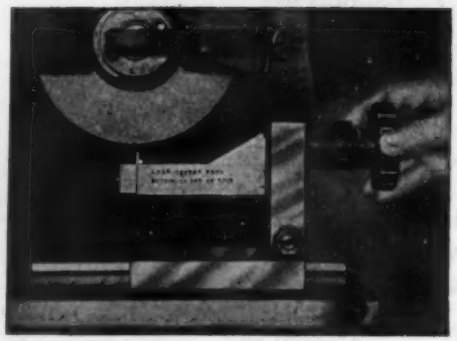
Two High Speed Tool Bits ground for drill jig.



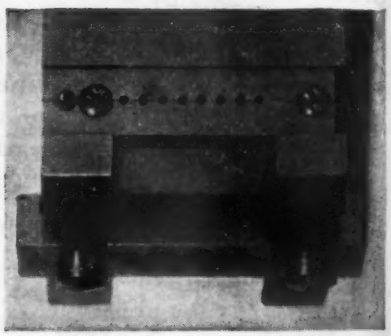
Drill jig completely assembled.



The diamond is set by simply measuring with micrometer from top of hood to bottom of arm.



The C-66 provides an important safety feature in that hands are kept away from under the wheel.



Drill jig completely assembled.

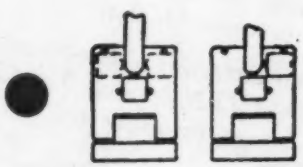
For dressing wheels for grinding turning tools, the dresser is set at angle equal to clearance angle of tools. The C-66 is the only radius dresser with this feature.

Long Wearing Chisel Point Diamond

The diamond holder is held against a ground vee in the arm. By means of this construction any size diamond up to 3/8" can be held accurately in line with the vertical center line of spindle.

.013 Male and Female Radius

.500 Male and Female Radius



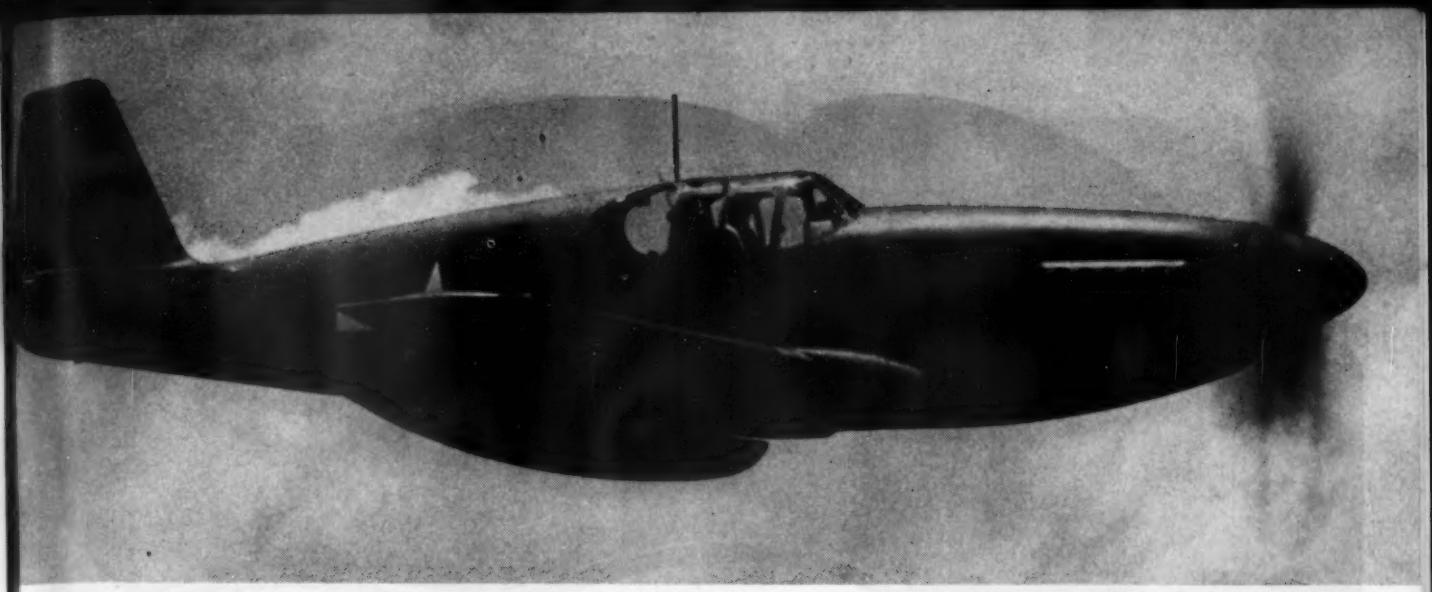
180° and 90° Male Dressing.

Prompt delivery from factory in Newark, N. J. Price, without diamond, $82.50, 1/4 K diamond, $5.00.

SCHULTZ & ANDERSON CO.

MACHINE TOOLS

109 C EDISON PLACE NEWARK, N. J.



Photo—Courtesy Aviation Magazine

SETTING STUDS IN AIRCRAFT ENGINES with MODERN SELF-OPENING STUD SETTERS

Many aircraft engine builders are setting studs by the slow and costly hand method and have kept away from setting studs by power.

●

Packard are now using power and the Modern Stud Setter for driving 1/4" and 5/16" — studs in the upper crankcase of the Packard Rolls Royce Engine, which results in great saving in the cost of driving studs.

●

Full information on the Modern Stud Setter will be sent on request.

MODERN TOOL WORKS

DIVISION OF

CONSOLIDATED MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

WITH TRU-LINE TOOLS You Save 4 WAYS!

TRY a TRU-LINE Engineered Diamond Tool and you'll learn first hand why production men everywhere are turning to TRU-LINE. For TRU-LINE Diamond Tools engineered to your job will give you all these savings in time and money:

YOU'LL SAVE because the TRU-LINE multiple diamond tool requires no turning. That means less machine down time—greater production.

YOU'LL SAVE because of the unique feature of placing the diamonds in overlapping rows. This provides a continuous cutting surface for the life of the tool.

YOU'LL SAVE because the thin blade that dissipates heat rapidly is made of our own alloy that forms a rugged, chemical bond with the diamonds, thus permitting the diamonds to be used up entirely.

YOU'LL SAVE because the use of smaller, high quality, carefully selected diamonds means much lower tool costs.

There is a TRU-LINE Tool for every type of straight, profile or step dressing operation—one that will bring to your job faster production, greater accuracy and remarkable savings in wheel dressing costs. Try one TODAY!

WHEEL TRUEING TOOL COMPANY

3200 W. DAVISON AVE.
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HAVE YOU RECEIVED A COPY OF THIS BOOK?

It gives complete details, illustrations and prices of this complete line of money-saving diamond wheel dressing tools. Write for your free copy today.

★ ★ ★

WETMORE "Producers"

For HEAVY CUTS and HIGH PRODUCTION

• Wetmore Producers are specially designed for extra heavy roughing and finishing operations—to remove large amounts of stock faster and better. Like all Wetmore products they have features that offer definite advantages where the high production of precision holes is desirable.

The type 41 Wetmore Producer, shown above, is for roughing; type 61, its companion model, is a finishing tool. Wetmore builds modifications of them for special requirements.

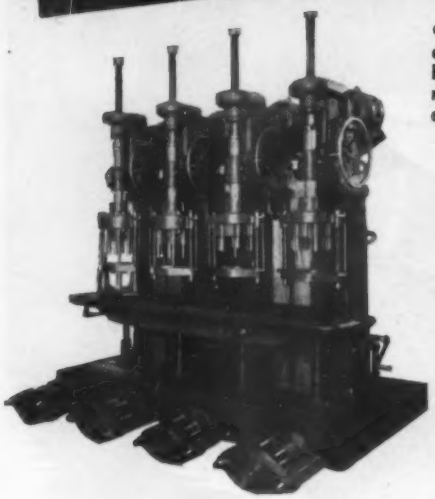
When reamers and boring bars are needed on the job—Wetmore Tools are the natural answer. See your industrial distributor or write us direct.

The new Wetmore catalog contains complete tool specifications and details together with important data and information you will want. Write for your copy today. Free to executives and engineers.

WETMORE REAMER CO., 418 No. 27th St., Dept. A, Milwaukee 8, Wis.

Versatility of HOEFER HEADS

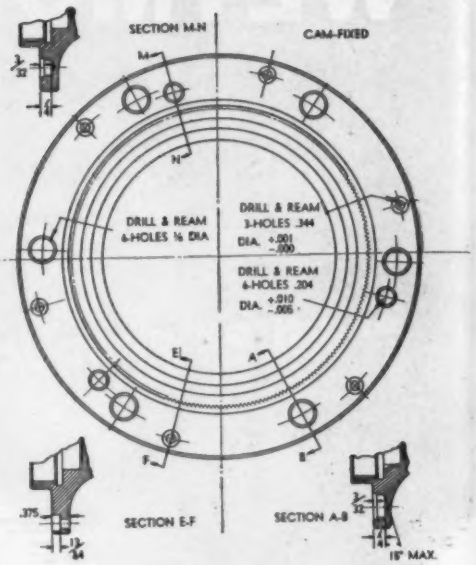
Speeds Production in Many of America's Armament Plants



• The line drawing shows a typical job done by HOEFER Multiple Spindle Heads. The machine at left drills and reams 15 holes in three different diameters and to three different depths.

• HOEFER Heads used for such important work as that of armament production adds further proof to the ability of these heads to simplify the drilling of holes in multiple and to speed up the work. Also it suggests the great value these heads can be to you in your post war production.

• Due to our long years of experience in producing multiple spindle heads for a wide variety of applications we are in position to study your problem and suggest the correct head to fully meet your production need. Send us your blueprints and number of parts you need for one day. Save on the purchase of costly drilling equipment.



Hoefer's Whole Business is Holes . . . . **HOEFER MFG. CO.** *Freeport, Ill.*

Insure continuous, trouble-free tapping production The HASKINS Way, combining Haskins AIR CONTROL with the right fixture. Add Piece Part Control and you approach completely automatic tapping. Placing the part in the fixture actuates a micro-switch—AIR does the rest. Each piece is tapped uniformly, precisely—faster than by any other method. For complete information on high speed tapping The Haskins Way, send for our latest catalog. R. G. Haskins Co., 2761 W. Flournoy St., Chicago, Ill.

HASKINS **haskins**

PRECISION TAPPING EQUIPMENT

WITH

JOHNSON'S MOLD & LADLE

An adequate supply of lead hammers is a "must" in shops where blows must be struck without marring work.

Keep your supply intact and safe to use by re-molding badly damaged hammers with the Johnson Mold & Ladle. It's the easy, economical, quick way to make new hammers out of old. Send for illustrated bulletin and price list to-day. Address Dept. A

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1 *Scotch Tape Test on this 75 mm. steel smoke shell shows how paint peels from improperly prepared surface, causing rejects.*

2 *Same test on twin smoke shell, conditioned before painting with Oakite Compound No. 86, demonstrates complete paint adhesion.*

Scotch Tape Test tells revealing story behind the paint coat on these 75 mm. shells!

Here's How to Avoid Rejects Due to Paint Adhesion Failure!

WHEN paint blisters, peels or cracks, it means parts must be rejected. And rejects cost money, delay production, lower output. But you can avoid paint adhesion failure by conditioning ferrous surfaces before ALL your organic finishing operations with a newly developed, scientifically engineered material, OAKITE COMPOUND No. 86.

SEND FOR *FREE* SERVICE REPORT

It explains how this NEW acid-type detergent, in ONE time-saving operation: (1) removes light oils, grease, shop dirt and other foreign matter; (2) inhibits surfaces against rusting while parts are being held for painting; (3) provides better surface grippage . . . assures MORE TENACIOUS BONDING of paint to steel and iron surfaces. Prove this to yourself by making the Scotch Tape Test! Designed for use in automatic washing machines, Oakite Compound No. 86 is safe to product and equipment . . . helps speed-up production. Write TODAY for this FREE Service Report giving additional details.

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Technical Service Representatives in All Principal Cities of the United States and Canada

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MATERIALS . . METHODS . . SERVICE

FOR EVERY CLEANING REQUIREMENT

MACHINE SHOP TIME-SAVERS

- Heavier Loads
- Faster Speeds
- Deeper Cuts

with **IDEAL**

LIVE CENTERS

IDEAL Live Centers help you turn out MORE work in LESS time, on lathes, millers, grinders, etc. They turn heavier loads and make deeper cuts — faster, because they rotate with the work. Precision built — radial load is carried by high precision ball bearing, thrust load is absorbed by high precision taper roller bearing.

FOUR *INTERCHANGEABLE INSERTS for all kinds of centered and uncentered work.*

IDEAL DEMAGNETIZERS

Remove metal dust, fine chips, flakes, etc. from Tools and manufactured parts by a single pass across the magnetic poles. Powerful — Portable — Keep Tools Sharp Longer. Two sizes.

IDEAL "MACHINE SHOP" ETCHER

Marks legibly, easily, permanently on all smooth-surfaced iron, steel and their alloys, regardless of the hardness of the metal. 14 etching heats from 115 to 1300 watts.

FREE . . .

Machine Tool Accessories Catalog.

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Selected for SERVICE

Speed your output with Criterion Diamond Tools. The kind of service they give is responsible for the swift, steady increase in their use. Quality of diamonds employed plus a unique method of setting assure extreme rigidity and extra tool life. Special tools made to order following blueprints or specifications. Sharp-pointed, selected thread grinding tools. Ask your dealer or order direct. Request free literature.

CRITERION

MACHINE WORKS

BEVERLY HILLS, CALIFORNIA

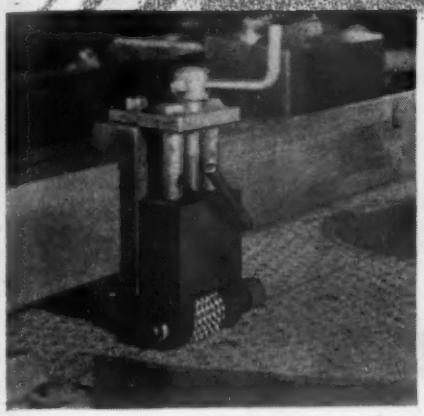
SPI-RAL

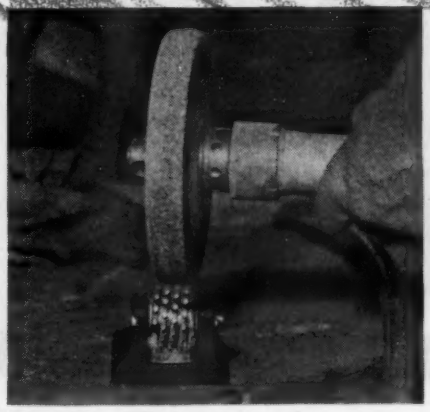
EMERY WHEEL DRESSERS

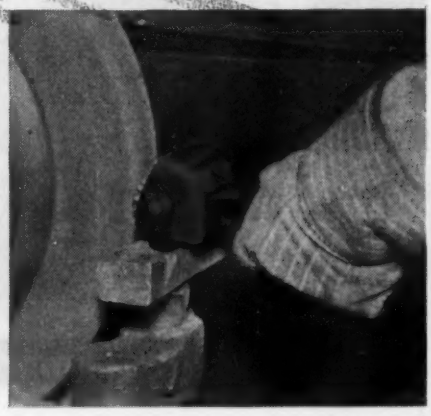
Perfect Conditioned Grinding Wheels at Much Lower Costs...

PAT. PEND.

"LIKE A RARE JEWEL IN A CLASS ALL ITS OWN CANNOT BE OUTPERFORMED"







SPECIAL HOLDERS

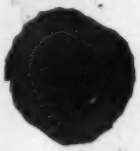
Special applications for the SPI-RAL cutter are numerous. Pictured above is just one of the many special holders being built for special dressing operations. The above is a 54" disk wheel being dressed with one No. 410 SPI-RAL cutter. We welcome any inquiries regarding emery wheel dressing.

The D-310 SPI-RAL dresser being used to dress and recondition the emery wheel of an air operated hand grinder. The D-310 SPI-RAL dresser is fastened to the bench and the operator, with very little effort, moves the running emery wheel over the SPI-RAL dresser and in a few seconds reconditions the grinding wheel.

The SPI-RAL dresser is never tilted when applied against the emery wheel, but is held as shown in the picture above. A sure grip, an even pressure, held straight against the wheel, "no tilting" and a slow movement from side to side will result in a true and well dressed emery wheel, free of foreign matter, grooves and ruts.

No. 10 SPI-RAL DRESSER

For tool grinders and wheels that require a very fine finish.
No. 10 Dresser Complete....$2.50
No. 110 Cutter Only..... .75



No. 21 SPI-RAL DRESSER

For medium or soft grain wheels where a smooth surface is desired.
No. 21 Dresser Complete....$2.55
No. 210 Cutter Only..... .80

No. 31 SPI-RAL DRESSER

For fast dressing of coarse wheels. For foundry or any other snagging operations.
No. 31 Dresser Complete....$2.60
No. 310 Cutter Only..... .85
Nos. 110, 210 and 310 cutters are interchangeable in the same handle.
Cutters are 1¾" diameter by 1 1/16" long.

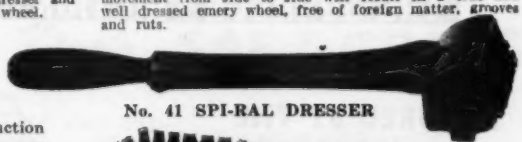
PROPER APPLICATION OF THE SPI-RAL DRESSER

The principle of design and construction of the SPI-RAL cutter is basically new and is covered by patent rights. The cutter is made in a single piece spiral, in various sizes, which, when employed in the dressing operation of an emery wheel, cuts across the face of the wheel evenly, rather than bumping off the grain. The result is a truer dressed wheel with not only an economy effected in the life of the emery wheel, but in the longer life of the dressing cutter itself.

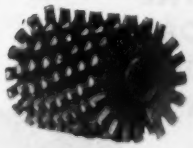
The cutter revolves on a bushing which in turn revolves on the shaft, giving it a double bearing and reducing friction to a minimum.

All moving parts are properly hardened and are provided with oiling facilities.

The hooded handle protects the operator from flying abrasives.



No. 41 SPI-RAL DRESSER



For wheels 2½" wide or wider. For foundry and coarse grinding operations. Rugged construction for heavy duty service.
No. 41 Dresser Complete $3.50
No. 410 Cutter Only..... 1.25

No. 42 SPI-RAL DRESSER

For wheels 2½" wide or wider where a smooth finish and fast cutting action is desired.
No. 42 Dresser Complete $3.50
No. 420 Cutter Only..... 1.25
Nos. 410 and 420 cutters are 1⅝" by 2½" long. Interchangeable in No. 41 handle.

No. D HOLDER FOR DISC GRINDER

Nos. 110, 210 and 310 cutters interchangeable in No. D holder. Unless specified, No. 310 cutter is furnished.
No. D-310.....$2.85

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STANDARD TOOL & GAGE CORP.

Precision Built Tools and Gages

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Standard Tool & Gage Corp.
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Gentlemen: Please send me additional information on Spiral Dressers

Name .....

Company .....

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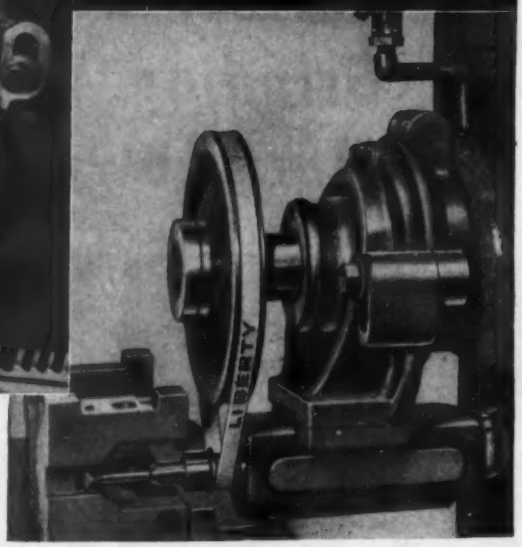
Grinding Those Difficult Jobs with Liberty High Speed Grinding Attachments



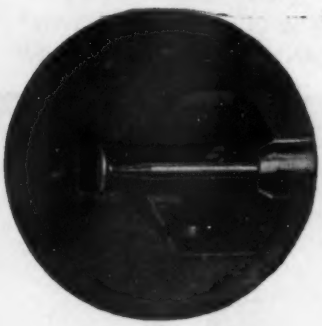
ABOVE
No. 90-31 Vertical, sharpening broach with 5° clearance.
AT RIGHT
No. 90-30 Horizontal, grinding a difficult keyway in a hard-to-get-at place.

Surface Grinders Do Double Duty

Liberty High Speed Grinding Attachments for surface grinders are precision tooled for greater accuracy on intricate and hard-to-get-at precision grinding jobs.

Write for Detailed Information

LIBERTY TOOL & GAGE WORKS INC.
241 Georgia Avenue, Providence 5, R. I.



Close-up of operation shown at left.

Tomorrow's Tools for Today's Tasks

THE JOHNSON FRICTION CLUTCH

QUICK DISENGAGING ASSURED BY THE NEW "MAXITORQ" . . . MULTIPLE FLOATING DISC CLUTCH

Double Type

Single Type

This recent Carlyle Johnson development features floating discs, manual assembly, simple adjustment and smooth, easily controlled engagement.
In the wet type, all discs are of hardened steel and run in lubricant; dry type with alternate discs of steel and self-lubricating bronze. Separator springs between active discs assure quick disengaging and prevent excessive drag.
"MAXITORQ" Clutches represent a distinct advance in this type of mechanism and are applicable for all types of power transmission where smooth operation and quick action are required. Made in capacities from ½ HP to 5 HP at 100 R.P.M., in single, double and cut-off coupling types.

Investigate Today! Send for detailed specifications and dimension sheets

WRITE FOR MULTI DISC CLUTCH CATALOG NO. 54 OR CONSULT SWEET'S OR THOMAS' REG.

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER, CONN.

500% INCREASE *in Marking Production*

Greater unit speed provides a money-saving solution to many marking problems. This power-operated machine marks by the precision rolling process, combining speed with accuracy. Uses three marking dies, adjustable for varying sizes. Automatic safety devices and registration of numbering or marking. Automatic unloading. Investigate "Noblewest" marking equipment and discover new production economies.

The Noble & Westbrook Manufacturing Co.
"Specialists in Rapid, Precision Marking Equipment"
17 Westbrook Street East Hartford, Conn.

SLIPPERY FLOORS ARE DANGEROUS!

Eliminate ACCIDENTS!

Keep your floors safe and clean with Park SAF-T-GRANS

Don't let slippery floors rob you of vital help. Park's SAF-T-GRANS actually removes oil and grease from wood, steel or concrete floors by its physical action of absorption.

This new idea in cleaning oil soaked and greasy floors reduces cleaning time to a minimum, thus saving manpower for more productive jobs. SAF-T-GRANS reduce fire hazard because they do not burn readily, even when saturated with oil. They are safe to use too for they do not harm the hands or clothes.

SAF-T-GRANS do such an efficient job of cleaning it will pay you to try a bag of this cleaner to prove to yourself SAF-T-GRANS are superior to ordinary types of cleaners. Order a bag today!

SAF-T-GRANS ARE EASY TO USE

By merely spreading a layer of SAF-T-GRANS over the floor and sweeping with a push-broom all traces of oil and grease are removed. After the original accumulations of dirt and oil have been removed smaller amounts of SAF-T-GRANS are required.

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PARK CHEMICAL CO.
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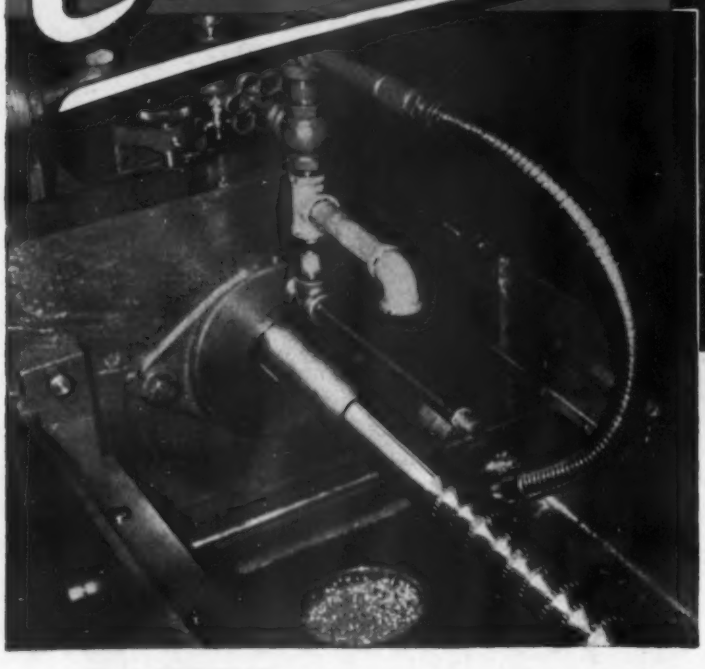
Change to Broaching



From Boring SAVES 48½ MINUTES PER PIECE

A large manufacturer formerly produced hydraulic cylinders for aircraft by boring, grinding and honing. The boring and grinding operations alone required 50 minutes. Now these parts are broached and honed. This method requires 1½ minutes per piece exclusive of the honing. The broaching produces a surface comparable to the ground surface so that both pieces require about the same amount of honing. Thus 48½ minutes are saved on every piece and several turret lathes and grinders, together with their operators, are released for other work.

This is a typical example of the savings in time and cost and the product improvement made possible where Detroit Broach tools and accessories are used. Go over your production plans with a Detroit Broach Company engineer. He may be able to suggest several ways in which broaching can help you gain greater production at lower cost. He will be glad to submit complete cost and production data without obligation to you. Write Detroit Broach Company today.

ARMY (E) NAVY

DETROIT BROACH COMPANY

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9308 SANTA MONICA BLVD. • BEVERLY HILLS, CALIFORNIA

BETTER SHOP PRACTICES TODAY

are part of your Post War Planning

● There is no doubt about the fact that many shop practices dictated by today's crying need of top efficiency production will carry over into greatly improved production practices in the postwar era.

Education of shop men in methods of tool conservation, for example, has been a war necessity, but can become a definite profit item for you in postwar competitive production. Thus today the Cushman Chuck Check Card helps prolong the life of these fine precision tools for more effiicient war production, but its use in your plant can well form part of a plan for greater efficiency in shop operation that will find your organization better prepared for postwar production . . . better able to make a profit in postwar competition.

CHUCK-V-CHECK

A STITCH IN TIME FOR VICTORY

The chuck on your machine needs a LITTLE attention REGULARLY. Neglect of these rules will affect the accuracy of your work and cause "down time". Chucks are essential war production tools. "Keep 'em running to keep 'em flying."

1. Check lubrication on every shift.
2. Wipe surfaces . . . especially spindle noses and bearing surfaces . . . CLEAN of chips, etc. before mounting.
3. Never FORCE chuck on spindle nose.
4. Keep keyways, jaw bearings free from dirt, chips, etc.
5. Do NOT open jaws beyond outer edge of chuck circumference (use larger chuck if necessary)
6. Use correct jaw equipment for work to be held.

CUSHMAN CHUCKS

A WORLD STANDARD FOR PRECISION

THE CUSHMAN CHUCK CO. HARTFORD, CONN.

We will be glad to supply a quantity of Chuck Check Cards for use in your plant and suggest that they be posted near all machines using Cushman Chucks.

CUSHMAN CHUCKS

A WORLD STANDARD FOR PRECISION

HARDSTEEL TOOLS

YOU HARDEN IT—WE'LL DRILL IT

"Hardsteel" Drills

SPEED THE DIES FOR THE WINGS OF TOMORROW

"HARDSTEEL" drills in thousands of plants are speeding die production—drilling hardened dies when last minute engineering changes call for holes in new locations or for additional holes—saving both critical materials and countless man-hours.

For fast, accurate drilling of steel hardened by any process to Rockwell "C" 40 or harder, there is only one answer—"HARDSTEEL," the three-cornered drill made from a special alloy material that can be reground quickly on any wheel.

"HARDSTEEL" is also available in reamers, tool bits and special tools. These tools are setting excellent production records on tough, hard-cutting steels and abrasive non-ferrous alloys.

Complete data on "HARDSTEEL" tools is contained in the "HARDSTEEL" Operator's Manual, together with instructions for using and many illustrations showing both parts recovery and production operations. Copy free on request.

BLACK DRILL COMPANY
1400 EAST 222nd STREET • CLEVELAND 17, OHIO

"HARDSTEEL"
DRILLS · REAMERS · TOOL BITS · SPECIAL TOOLS

WHALE

WHALE BRAND HACK SAW BLADES

Here's the original, time-tested HY-FLEX BLADE . . . scientifically heat treated to add the toughness that gives these blades their outstanding performance. They are gauged and checked throughout every step of their manufacture and given a stiff bending pounds test before you get them for use. HY-FLEX meets today's demand for a medium priced blade which is extremely flexible, yet has the toughness that assures long service life.

Here's a Whale of a Blade of a special analysis molybednum, high speed steel that gives unusual cutting service. Can be used at the same cutting speeds as tungsten and deliver practically equal performance. If you want outstanding results on stubborn cutting jobs, ask your mill supply house for WHALE BRAND HY-FLEX and MO-HY BLADES and you'll get it.

Get to know the satisfaction in WHALE BRAND HACK SAW BLADES and FRAMES • BAND SAWS • COPING SAW FRAMES and BLADES • SCREW DRIVERS • HAND DRILLS. Ask for the catalog that describes these and other good FORSBERG TOOLS.

Forsberg
WHALE
• MFG. CO., BRIDGEPORT, CONN., U.S.A.

Right at the edge of a job *well done!*

Use of Slotted Abrasive Cloth Discs by Carborundum has resulted in amazing simplification of deburring and polishing operations on holes from 3/8" to 5 1/2" in diameter. Discs proportionately larger than the holes they are designed to deburr and polish are attached to power driven spindles. Pressed against the work, the discs cone, and give a true radius to the edges of the holes without touching the sides. It's a fine example of choosing the right abrasive product for the job.

The use of abrasives in deburring, polishing, and in tool room work has seen an enormous advance in the last year or so. That's why we urge you to call on Carborundum Abrasive Engineering Service for help with your abrasive problems. Just call our nearest sales office. The Carborundum Company, Niagara Falls, N. Y.

CARBORUNDUM
TRADE-MARK
ABRASIVE PRODUCTS

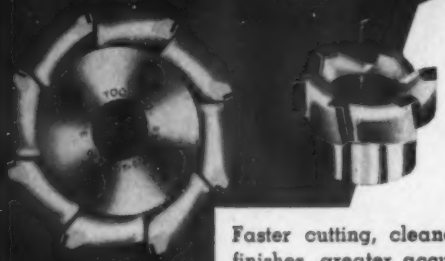
Sales Offices and Warehouses in New York, Chicago, Philadelphia, Detroit, Cleveland, Boston, Pittsburgh, Cincinnati, Grand Rapids

Coated Abrasives by CARBORUNDUM
TRADE-MARK

(Carborundum is a registered trade-mark of and indicates manufacture by The Carborundum Company)

HERE'S

SUPER CARBIDE TIPPED Economy FOR YOUR FACE AND END MILLING JOBS!



Faster cutting, cleaner cutting, finer finishes, greater accuracy . . . these carbide tipped efficiencies are now available for your face milling and shell end milling jobs. For Super Tool engineers have developed this new line of Carbide Tipped Shell End and Face Mills!

Here's another step forward in carbide tipped standardization! These cutters are available in standard sizes, both for non-ferrous materials and in the Super NEGRAK (negative rake) type for cutting steel. They are manufactured on a production basis and the shell end mills may be purchased in the left-hand type at standard prices. When you buy a Super Carbide Tipped Face Mill or Shell End Mill, you enjoy economies that start with the first cost and continue through every operation of the cutter's exceptionally long life.

Super Carbide Tipped Shell End Mills and Face Mills are worthy additions to the line of Super Carbide Tipped Tools —tools that are setting new records of performance and economy on all types of cutting jobs the country over. Write TODAY for details of the complete Super Tool line including these new Super Shell End and Face Mills.

Let us send you this literature giving complete details and prices of Super Shell End and Face Mills

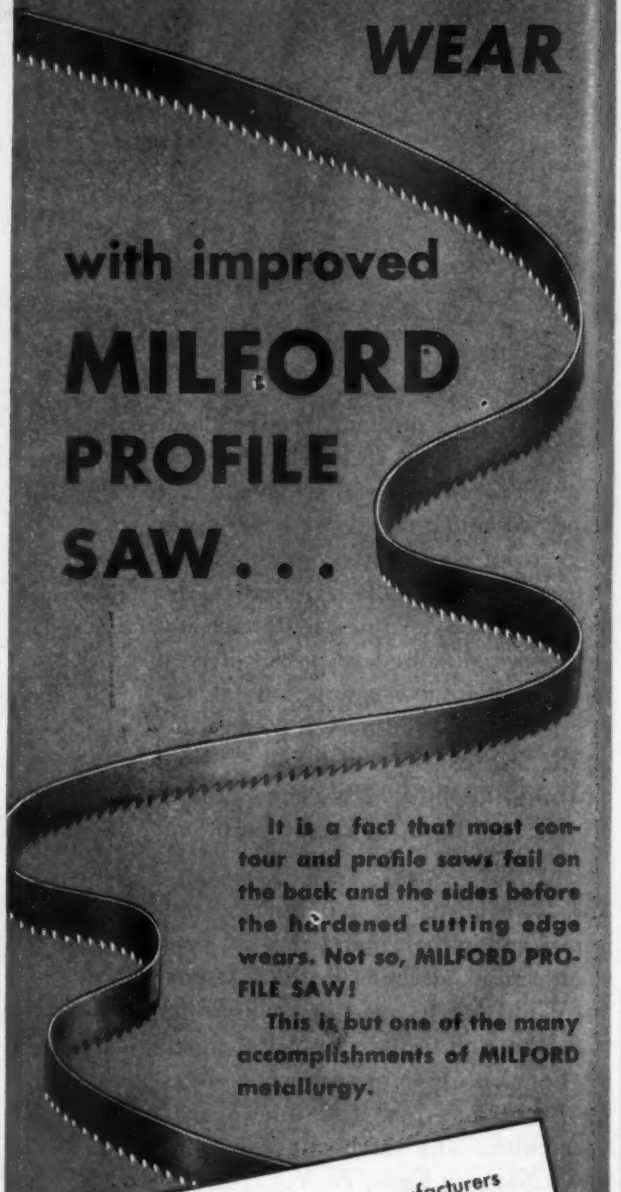
SUPER TOOL COMPANY

Carbide Tipped Tools

21650 Hoover Rd., Detroit 13, Mich. 4105 San Fernando Rd., Glendale 4, Cal.

Counteract BACK and SIDE WEAR

with improved MILFORD PROFILE SAW . . .



It is a fact that most contour and profile saws fail on the back and the sides before the hardened cutting edge wears. Not so, MILFORD PROFILE SAW!

This is but one of the many accomplishments of MILFORD metallurgy.

SERVICE? One of the large manufacturers of airplanes needed some PROFILE SAW in a hurry. They telephoned us . . . "Could we ship 8 miles of PROFILE SAW at once?" That was only a little over 42,000 feet, and we shipped it from stock that very day. True, we couldn't duplicate that every day, but our stocks are large and complete, and shipments are prompt.

THE HENRY G. THOMPSON & SON CO.

Saw Specialists Exclusively for Over 65 Years

NEW HAVEN, CONNECTICUT, U. S. A.

WHEN YOU *"Pick up the Threads"* OF PEACETIME PRODUCTION

—you will do it with greater ease and assurance, thanks to *Threadwell* Taps and the vastly superior resources of tapmaking skill, production, testing and inspection facilities created at *Threadwell* to meet war production demands.

Your postwar service-of-supply on Taps will be better than ever, too. The *Threadwell* distributor in your locality was selected for his ability and his willingness to match the intimate personal attention given by *Threadwell* to the needs of every *Threadwell* Tap user. His record of Tap supply service to war industry, however extreme or urgent the demands, has been consistently excellent.

You can continue to count on *Threadwell* Taps, the organization that makes them and the *Threadwell* distributor.

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CANADA *Bridge Machinery Co., Montreal*
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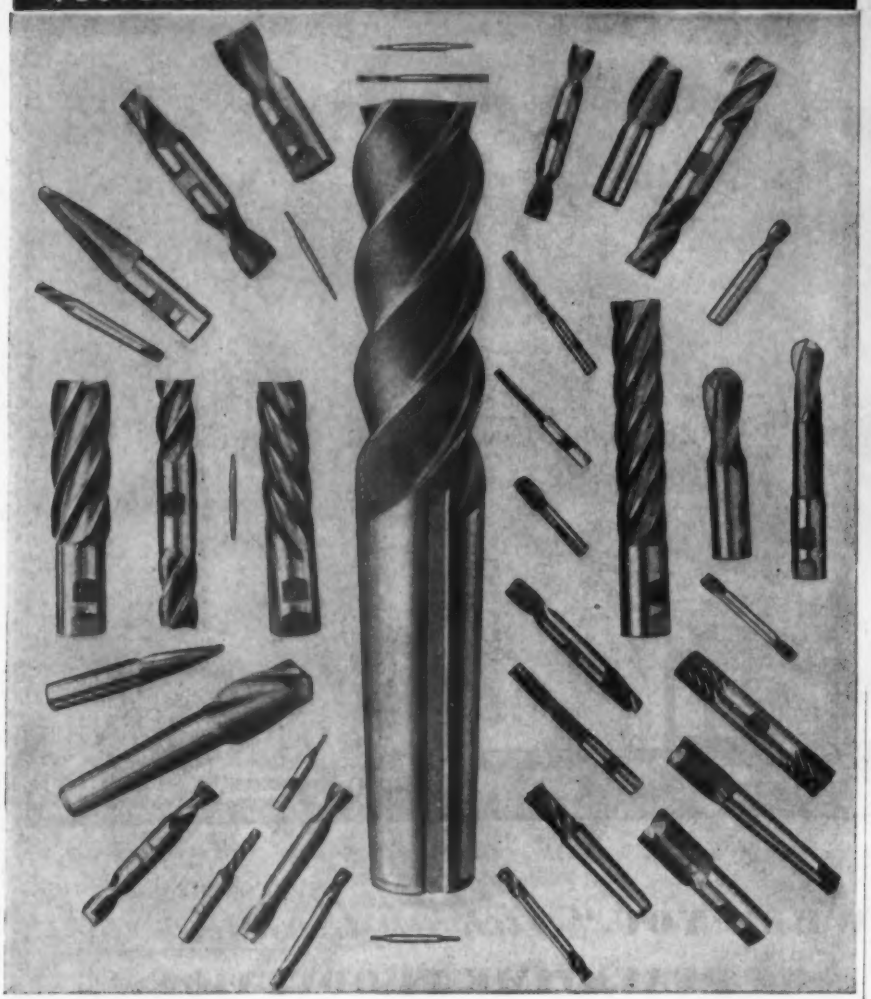
THROUGHOUT THE WORLD

Threadwell
SINCE 1902
"TAPS OF DISTINCTION"

THREADWELL TAP AND DIE COMPANY • GREENFIELD, MASSACHUSETTS, U. S. A.

YESTERDAY'S PIONEER . . . TODAY'S LEADER



Quality END MILLS

When you think of quality End Mills, large or small, stock or special, always think of WELDON. We are in good shape now to make specials to order. Special End Mills generally can be shipped in approximately four weeks.

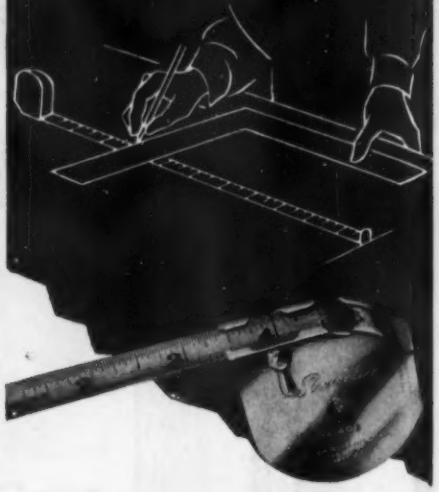
We can make immediate shipment of most sizes of WELDON End Mills. **Write for Stock List.**

THE WELDON TOOL CO. *Cleveland 4, Ohio*

3000 WOODHILL ROAD

NO. 3 IN A SERIES

USE IT FOR LAYOUT WORK



Where accuracy is a factor, the MASTER Streamline steel tape rule is a natural choice. It is six feet of measuring gauge rolled up into a two inch case. This versatile, handy rule serves not only as an accurate measuring device for layout work but also is useful as a scriber, height gauge, for inside measurements and outside calipered measuring. Easy to read from any position because graduations are clearly marked on both sides and all edges of the blade. Every rule comes equipped with a spare blade and patented lever lock which holds reading indefinitely — Price $2.65 each.

Write today for your free copy of this new 16 page pocket sized manual "Rules For Measurement".

$2.65 each complete with spare blade

MASTER

WOOD AND TAPE RULES

MASTER RULE MFG., CO., INC., Dept. P-5
815 E. 136th St., New York

Enclosed please find $2.65 for 6 ft. "Streamline" steel tape rule and spare blade.

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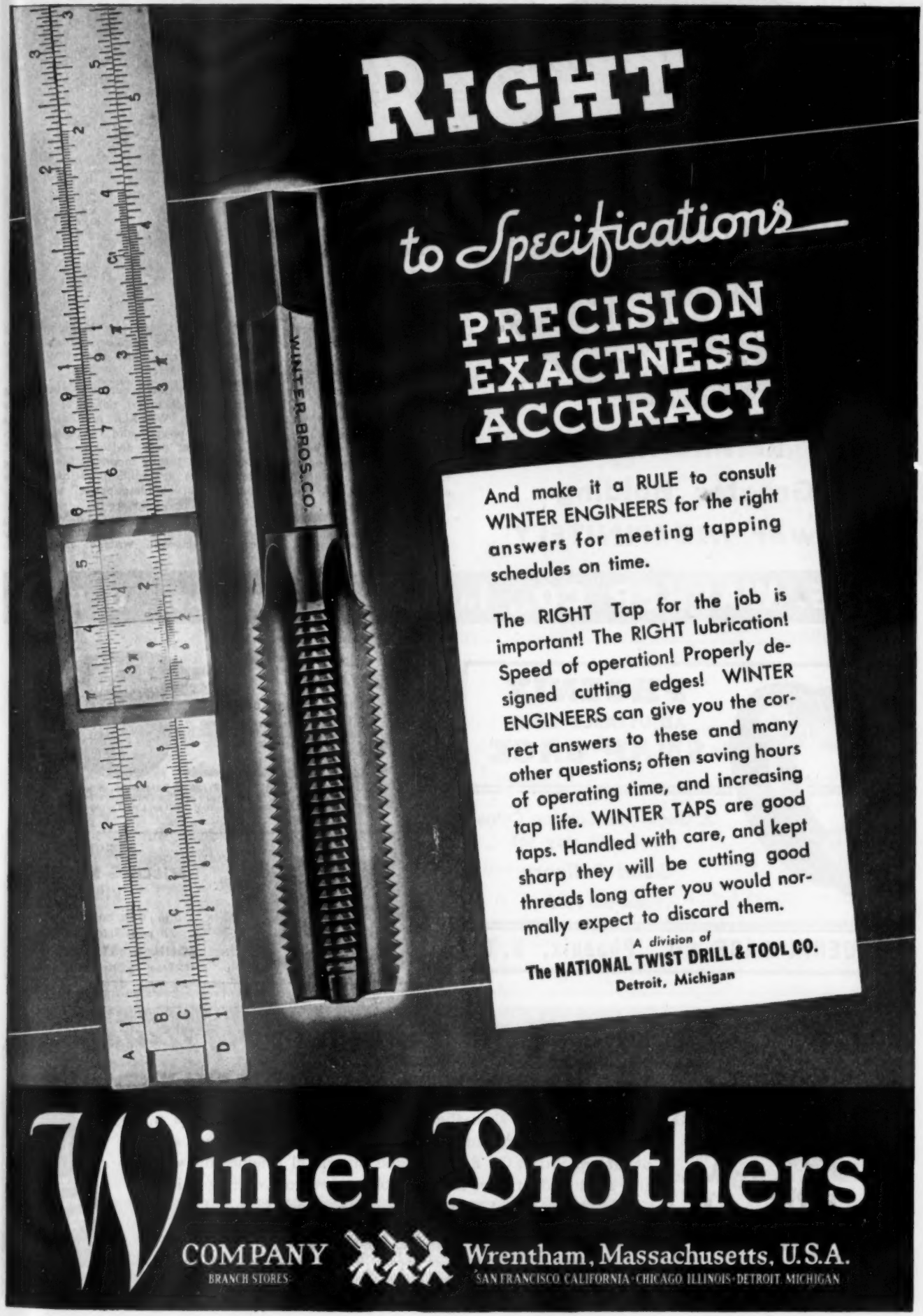
RIGHT
to Specifications
PRECISION
EXACTNESS
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And make it a RULE to consult WINTER ENGINEERS for the right answers for meeting tapping schedules on time.
The RIGHT Tap for the job is important! The RIGHT lubrication! Speed of operation! Properly designed cutting edges! WINTER ENGINEERS can give you the correct answers to these and many other questions; often saving hours of operating time, and increasing tap life. WINTER TAPS are good taps. Handled with care, and kept sharp they will be cutting good threads long after you would normally expect to discard them.
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The NEW WALKER PERMANENT MAGNETIC CHUCKS

RETAIN Their Greater Holding Power INDEFINITELY

WALKER Permanent Magnetic Chucks are now available. This new line is being offered in addition to the regular line of Walker electro-magnetic chucks which long ago made the name "WALKER" synonymous with this type of holding equipment.

The method of energizing on the new permanent magnetic chucks is a WALKER development after careful research over a period of years. In achieving the objective of this research, WALKER guarantees these new chucks to have 35% more "holding power" and 12% more effective magnetic area because of their finer pole divisions — only 3/16" between Pole Divisions Top Plate Area is totally magnetic, contributing to its superior holding power more parts per table load—giving more efficiency. WALKER also guarantees that "holding power" will be retained indefinitely.

It will pay you to know more about WALKER Permanent Magnetic Chucks as a means of speeding up present output or for post-war requirements. Several standard sizes are available for immediate shipment. Write at once for complete information.

O. S. WALKER CO., Inc., WORCESTER, MASS., U. S. A.

PHOENIX ADJUSTABLE LIMIT SNAP GAGE

A Gage with Locking Cams which will stay set

Good Delivery

Send for Folder

PHOENIX GAGE CO., Phoenix, N. Y.

Famous for

- ACCURACY OF THREADS
- LOW CHASER COST
- ALL AROUND DEPENDABILITY

Bulletins available: General Purpose Die Heads, Insert Chaser Die Head, Threading Machines.

See our Advt. on page 77 Nov. 11, '43 American Machinist

THE EASTERN MACHINE SCREW CORP., 20-40 Barclay St., New Haven, Conn.
Los Angeles: A. C. Behringer, 524 N. San Pedro St., San Francisco: Guy Reynolds, 464 Vernon St., Oakland, Canada: Arthur Jackson Mach. Tool Co., Toronto and Montreal.

Write for Bulletin

STEVENS MILLING MACHINE VISES

5 in., 6 in. and 7 in. sizes

All parts Interchangeable

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474 Canal St., New York 13, N. Y.

Begin with the finest cutting Fluids...

Stuart's Thred Kut SOLVOL "SUPER-KOOL" CODOL

THEN APPLY THEM PROPERLY . . .

● Anything less than the best cutting fluids available is a handicap to your production. Equally important is *proper application.* Stuart Oil Products and Stuart Oil Engineering will give all the advantages it is possible to get from cutting fluids.

For All Cutting Fluid Problems

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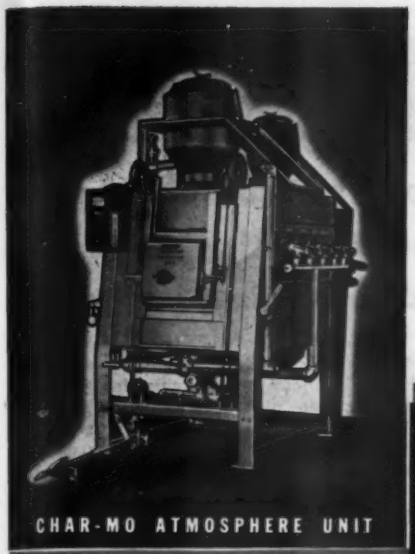
Warehouses in Principal Metal Working Centers

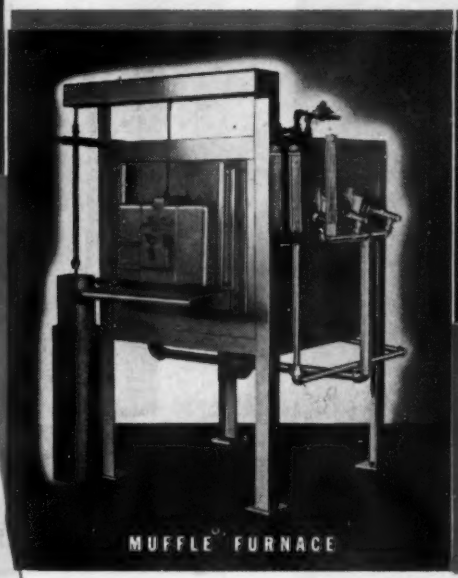
SURFACE COMBUSTION

STANDARD RATED

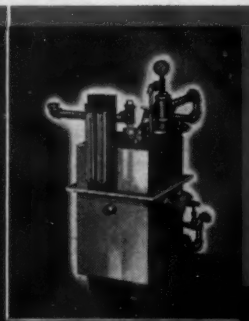
Atmosphere FURNACES



CHAR-MO ATMOSPHERE UNIT

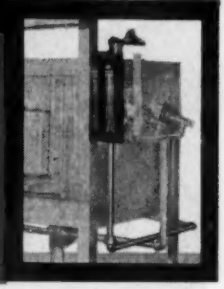


MUFFLE FURNACE



"MDX" ATMOSPHERE UNIT

"AG" ATMOSPHERE UNIT



Write for Bulletin AG-43 "Design features of Surface Combustion Standard Rated Atmosphere Furnaces"

● Metal surfaces are affected by gases and rapidly so at high temperatures. During heat treatment high temperatures cannot be eliminated, but the gases in contact with the metal can be controlled to protect the surface. Different conditions require different compositions of atmosphere gases.

From Surface Combustion Standard Rated Atmosphere Furnaces can be selected the proper furnace and the proper atmosphere to meet practically any requirement.

CHAR-MO FURNACES: Atmosphere generator is an integral part of the furnace. Char-Mo atmosphere (⅓ CO, ⅔ Nitrogen) prevents scaling and decarburization of practically all metals.

MUFFLE FURNACES: Are equipped with gas tight muffles to prevent products of combustion from contacting metal surfaces during heat treatment. Any required atmosphere can be introduced into the muffle of this type furnace.

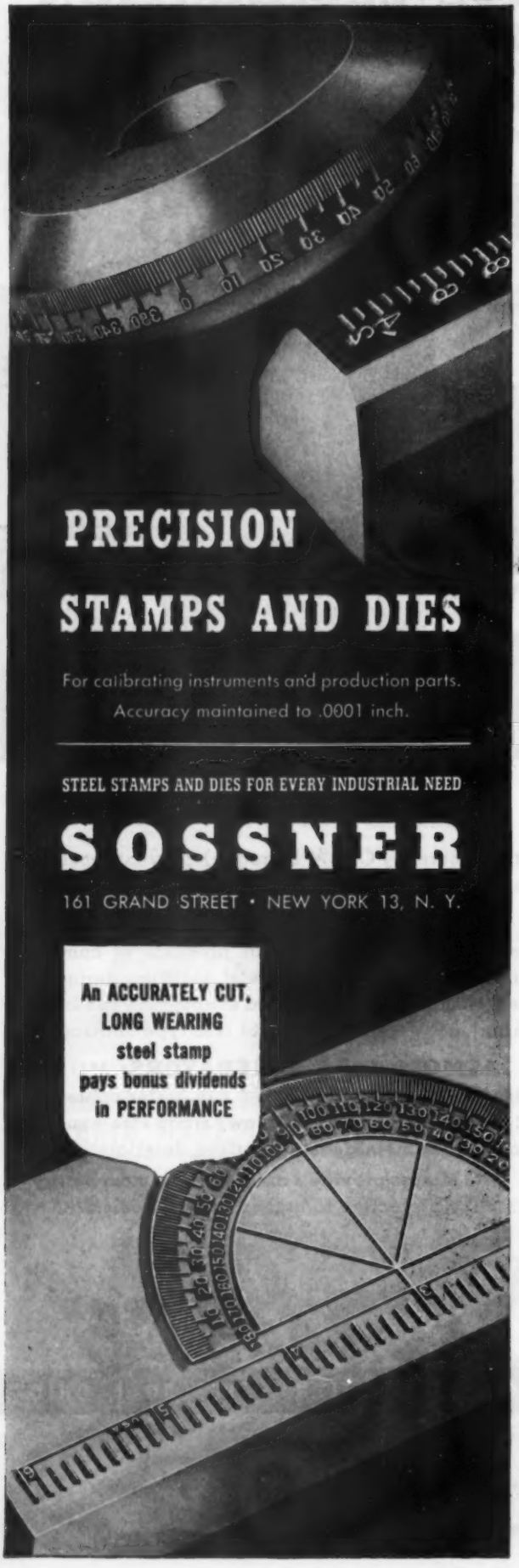
ATMOSPHERE GENERATORS: MDX Generator provides a burned gas, water cooled atmosphere which protects low carbon steels and non ferrous metals against surface deterioration.

AG Mixers provide a cracked gas atmosphere which is protective to higher carbon steels.

The Heat Treater's Helping Hand **'Surface'**

SURFACE COMBUSTION • TOLEDO 1, OHIO

Standard and Special Industrial Furnace Equipment For: Forging, Normalizing, Annealing, Hardening, Drawing, Carburizing, Nitriding and Heating. Special Atmosphere Generators. *Write for Bulletins.*



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STAMPS AND DIES

For calibrating instruments and production parts.
Accuracy maintained to .0001 inch.

STEEL STAMPS AND DIES FOR EVERY INDUSTRIAL NEED

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An ACCURATELY CUT, LONG WEARING steel stamp pays bonus dividends in PERFORMANCE

NATIONAL KEYSEATING MILLER

. . . the tool that converts drilling machines into key-seaters and saves time and money

• With this modern tool you can handle keyseating jobs not suitable for keyseating machines on any of your drill presses or radials. Keyseats with parallel sides, accurate in depth and in perfect alignment with bore axis are assured.

The National Keyseating Miller mills, keyseats in one cut. It can be used on taper holes, offset holes, blind holes and for taper keys. Work clamping is unnecessary. We also manufacture oil-grooving millers.

Made in twenty-six different diameters from ½" to 3½". Several widths of cutters can be used in each size.

WRITE TODAY FOR OUR NEW CATALOG NO. 15

NATIONAL MACHINE TOOL CO.
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Main Office and Works, Stapleton, Staten Island, N. Y.
TAPPING CHUCKS

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170 Broadway

CHICAGO
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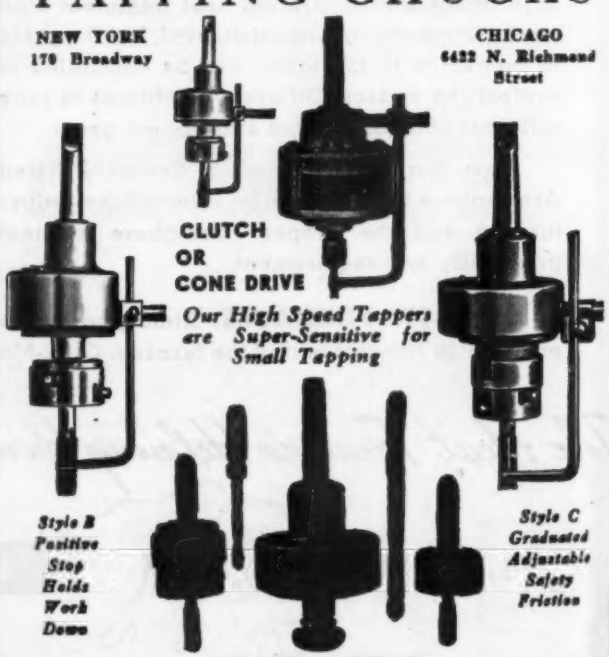

CLUTCH OR CONE DRIVE

Our High Speed Tappers are Super-Sensitive for Small Tapping

Style B Positive Stop Holds Work Down

Style C Graduated Adjustable Safety Friction

DRILL PRESS TURRET
Style D-E with Quick-Change Tool Holders to Drill, Tap and Set studs, etc., without moving work, or stopping or reversing machine. Individual friction adjustments in each tap-holder. If required.
Also, Opening Die-Heads; Opening Stud-Setters; Friction Screw-Drivers and Nut-Setters, etc.

Severance new tool craftsmen regrind worn tools with the same precise skill they use in making new tools. They give each flute the pitch and depth required to eliminate chatter. They carefully grind each tooth so your renewed tools take deep sharp bites like a new Severance Cutter. Each tool is given the Severite heat treat process that increases tooth hardness and lengthens cutting life 3 to 5 times. It will pay you to send your worn and dull cutters (hand ground, mill or chisel cut) to Severance for a factory regrind job.

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Midget Milling Cutters • Precision Regrinding

SEVERANCE TOOL INDUSTRIES INC., SAGINAW, MICHIGAN • PLANTS IN LONG ISLAND CITY 1, NEW YORK; DETROIT 2, MICHIGAN; FORT WAYNE, INDIANA; CHICAGO 6, ILLINOIS; AND LOS ANGELES 21, CALIFORNIA. IN CANADA: 60 FRONT STREET WEST, TORONTO, ONTARIO.

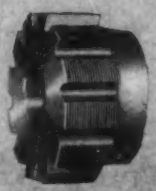
Thread Milling Hobs-Unground

MULTIPLE SERRATION CUTTERS

Specially Developed

In developing UNGROUND Hobs, it is vitally important to have the correct relief dependent upon work diameters—the degree of helical gash—the correct hardness for the metal to be threaded—whether internal or external threading.

Let us know the nature of the work to be done—the kind of machine in use—and we will design and produce UNGROUND Thread Milling Hobs that will show a marked saving in your tool costs.



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MOTOR TOOL MANUFACTURING CO.

METAL CUTTING TOOLS

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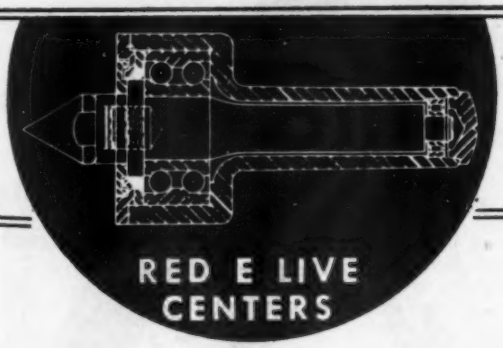
"Make it a Rule to Call Motor Tool"

LUBRICANT SEALED IN . . . GRIT KEPT *OUT* FOR LIFE



RED E LIVE CENTERS

Fully protected against chips, dirt and cutting compound by a positive seal. Bearing is lubricated for its life.

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THE READY TOOL COMPANY

IRANISTAN & P R AVES BRIDGEPORT CONN

The RANDALL & STICKNEY *Dial Test Indicator*

A valuable instrument for erectors and inspectors

Especially convenient for checking accuracy in surfaces and spindle movements; also for obtaining comparative measurements on close work and for lining up work on machine tools. Horizontal arm adjustable and can be removed for independent use. With blocks fitted into T slot of base, this R&S indicator can be used against edge of surface plate for checking accuracy of long horizontal surfaces. Dial diameter 2⅛", base 3½-2¾".

Complete details on request.

RANDALL & STICKNEY, Waltham, Mass.

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FEED IT FASTER with **LITTELL** AUTOMATIC CENTERING **REELS**

REEL off your stock for faster production with LITTELL Automatic Centering Reels, for a free-flowing loop of material to presses—hand or automatic feed.

Ask about the Littell line of Reels, Feeds (Roll, Dial, Magazine, Hopper), Straightening Machines, Air-Blast Valves, Pres-Vac Safety Feeders, etc.

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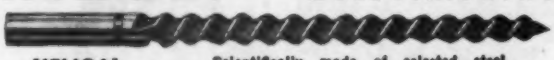
HOLMAN BETTER, FASTER HOLE FINISHING



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Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

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Patented Cutting Off Tool Holders
Patented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips—MEANS MAXIMUM CUTTING EFFICIENCY.

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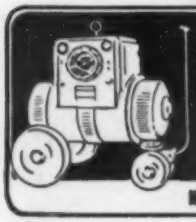
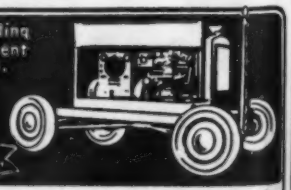


HOBART "Simplified" arc welders

HOBART Welding catalog. Sent on request.



HOBART BROTHERS CO., Box A.M. 5-25 TROY, OHIO

"One of the World's Largest Builders of Electric Arc Welders"

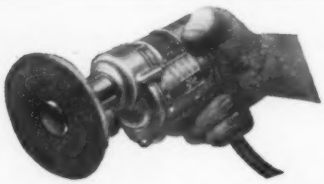
EXTRA JOBS

Done Quick and Easy!

These Accessories Make Any Electric Drill Adaptable for Many New, Different Jobs

WITH *Thor*

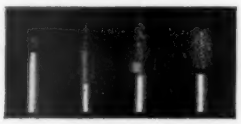
ACCESSORIES FOR PORTABLE ELECTRIC DRILLS



This Thor Sander Attachment can be used effectively on Thor Drills with emery papers 4" in diameter for both wood and light metal sanding. Its small size provides complete control and eliminates jumping around of the wheel.

MOUNTED ABRASIVE WHEELS AND POINTS

Use them for countless grinding finishing jobs on production and repair work, and in tool, die and machine shops.

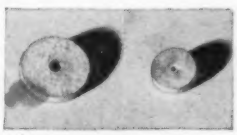


ROTARY FILES

Cannot be surpassed for fast, accurate, keen cutting and long life on scores of metal-removing jobs

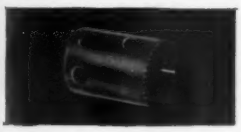
SANDING DISCS

All kinds of shops and plants find many uses for these discs for both wood and light metal sanding operations.



POLISHING WHEELS

Light polishing work goes faster with these wheels, which get into the smallest recesses ...turn out more work, better



HOLE SAWS

Cut clean holes in a hurry in wood, steel, brass, cast iron, marble, etc. Widely used in repair and maintenance work.

WIRE BRUSHES

Quickly remove carbon deposits, burrs, paint, rust and the like. Nearly every shop and plant finds many a use for them.

Genuine Thor Accessories FOR BEST RESULTS

GET MORE FROM YOUR TOOLS AND DO DOZENS OF JOBS FASTER

By use of sanding discs, mounted abrasive wheels and points, rotary files, hole saws and other Thor accessories, specially designed and processed for use with electric drills—of *all* types and makes—you can make your tools adaptable to dozens of different jobs of grinding, sanding, polishing, cutting, filing, sawing and cleaning. You'll get new speed and better work with *genuine* quality Thor accessories used with electric drills.

A SIZE AND STYLE FOR EVERY JOB!

In the complete line of Thor accessories for portable electric drills there is a wide range of sizes and styles of each accessory. No matter what your requirements in mounted abrasive wheels and points, rotary files, sanding or polishing discs, wire wheel brushes, hole saws and disc saws, Thor can meet your needs for size, shape and style. And *every* Thor accessory is *engineered to its work*... specifically designed and selected for use with electric tools... to assure you *best* results in making your tools adaptable for many different jobs.

Don't take chances... don't waste time and money with uncertain, unadapted accessories—use *genuine* Thor accessories and be sure! For full information, specifications and prices write for Thor Catalog No. 38.

Stocked and Sold by Leading **DISTRIBUTORS EVERYWHERE!**

Thor accessories for electric tools are sold by leading mill supply, electrical, automotive, plumbing and hardware distributors, to give quick, convenient, reliable service. Write for name of your nearest distributor.

INSIST ON GENUINE *THOR* ACCESSORIES

Thor *Portable Electric Tools*

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NORTON Resinoid WHEELS

on Seven Important Grinding Jobs

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ROLL GRINDING

It's "Know-How" That Produces Results for NORTON RESINOID GRINDING WHEELS

1. **Research "Know-How"** — It took Norton laboratory men thousands of man-hours to perfect the various Resinoid bond formulas in use now — each right for a certain type of grinding.
2. **Manufacturing "Know-How"** — Men who have been making grinding wheels for from a quarter to a half century put their knowledge to use with the best equipment obtainable.
3. **Engineering "Know-How"** — But it's the Norton abrasive engineers who get into the shops and make the final selection — a selection that may make the difference between success and failure of a grinding wheel.

No, Resinoid bond alone does not assure the best grinding wheel performance. It needs the Norton "Know-How" to get the maximum in production.

Popular Specification of NORTON RESINOID WHEELS

Weld Grinding

24-Q4T-H (straight wheel)
16-P4T-H (cup wheel)

Disc Grinding

16-K4T (Steel)
3724-K5T-L (Cast Iron)
3730-J4T (Aluminum)

Snagging

Swing Frames
14/2-P4T-L (Steel Castings)
3714-04T (Cast Iron)

Floor Stands
14/2-04T-L (Steel Castings)
3716-04T (Cast Iron)

Thread Grinding

150-U9T-H

Cutting Off

30-W7T (Steel)
24/5-S8T (Aluminum)
(#12 Treated)

Roll Grinding

3736-M7T (Chilled Iron)

Billet Grinding

12/3-T4T-H (Swing Frame)
24-P4T-H (Portable)

These specifications have proved outstandingly popular in many plants. Norton abrasive engineers will be glad to study your specific jobs and recommend the resinoid wheels most suited for your particular conditions.

NORTON ABRASIVES

NORTON COMPANY
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Ends and center pieces furnished by customer—we supply tube and weld in four places.

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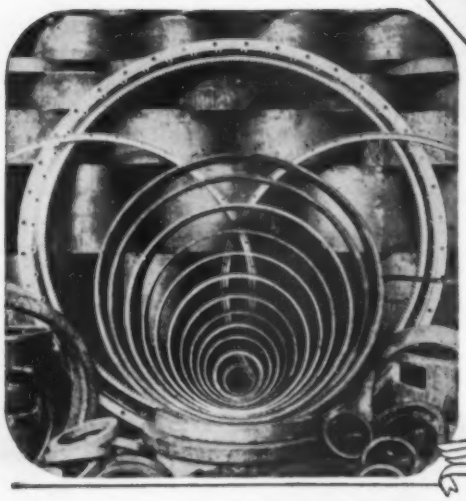
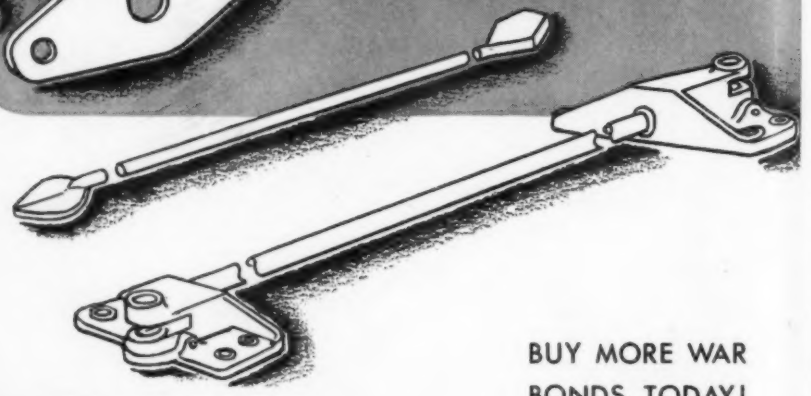
May we tell you more? The American Welding & Manufacturing Co., Grizwald St., Warren, Ohio.





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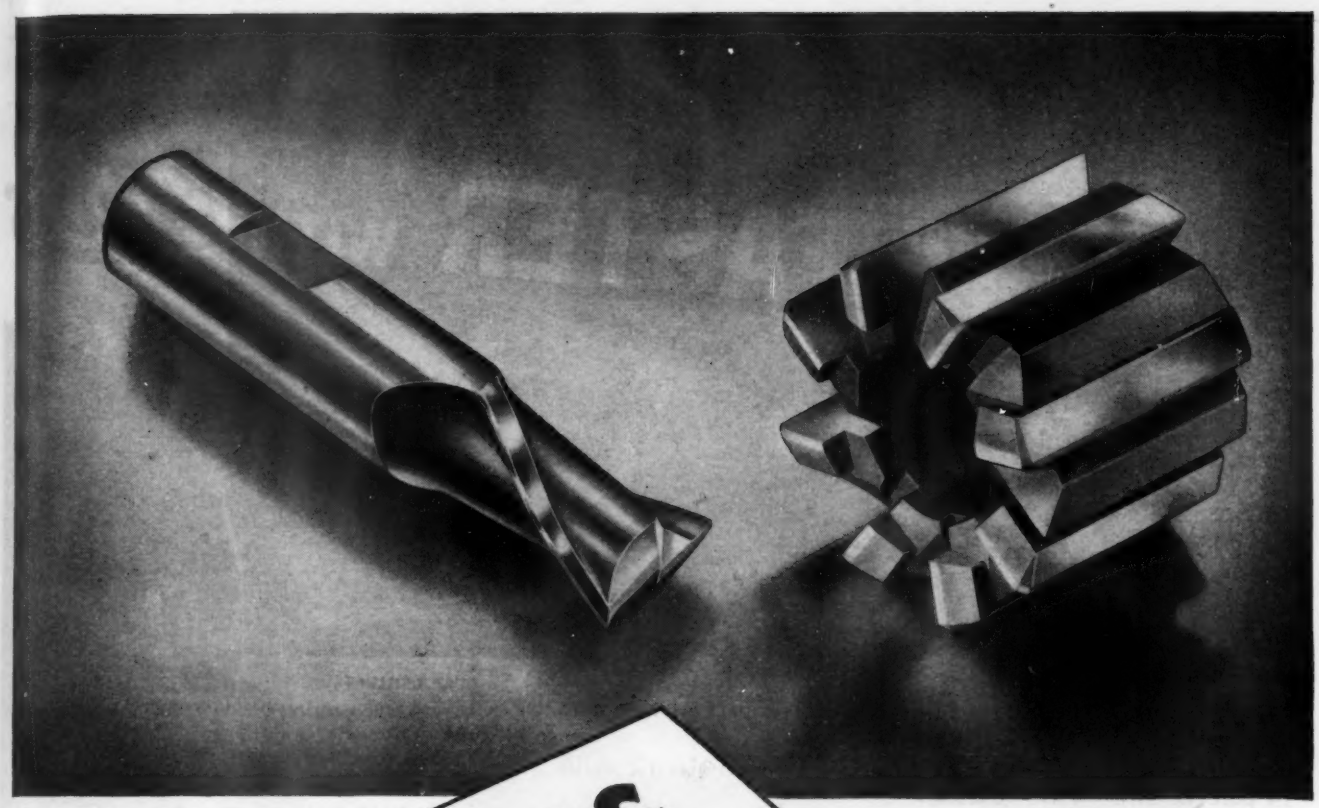

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Solid End Mills and Shell End Mills with brazed-in Tantung blades are establishing production records, all over the country. Many jobs that were slow and expensive when high-speed steel cutters were used are now being milled faster and cheaper with TANTUNG. Use Tantung cutters when you cannot use Carbide.

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Are made in two and four flutes and are furnished both for steel cutting and non-ferrous metal cutting.

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Tantung is fully covered, graphed and illustrated in the Tantung Tool Catalog. Write for your copy today.

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These cutters are made of a tough alloy steel body, with brazed Tantung blades. Designed to fit standard arbor equipment.

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STAR DRILLING like this is fast and sure with the Thor Portable Electric Hammer—for drilling and hammering in stone, wood or metal.

• Thor Portable Electric Tools combine compact power with light weight to do scores of jobs *faster.*

For example—Thor *reduced the weight* of ¼-inch electric drills 14 percent with plastic housings.

Thor *increased the power* of electric hammers with a patented "sling-shot" drive.

Thor introduced *compact power* with the original, close-coupled half-inch electric drill.

The features of greater power with easier handling combine to give you *more efficient performance* with Thor Portable Electric Tools for all types of light and heavy duty drilling, screwdriving, reaming, nut setting, tapping, grinding, sanding, polishing, sawing, metal cutting and hammering.

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OUTSTANDING THOR FEATURES OF DESIGN AND CONSTRUCTION

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THOR MOTORS are fabricated of the highest grade materials, with armatures carefully wound and insulated to withstand heat and vibration. Commutators are assembled with special care to avoid floating segments or raised bars.

Thor Gears

THOR GEARS are made of heat treated alloy steel with oversize pitch to assure smooth operation and longer life.

THOR VENTILATION of the tangential type provides 25% greater cooling capacity.

Thor Bearings

THOR BEARINGS of the highest grade, are mounted in cast-in steel inserts and diamond bored to assure perfect alignment.

NEW HELP FOR YOU IN SELECTING ELECTRIC TOOLS

Just off the press, the latest edition of Thor Portable Electric Tool Catalog is packed full of information on the selection of proper tools for your work. 64 pages of complete specifications, performance data, construction features . . . arranged for quick and easy reference and fully illustrated.

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ASSEMBLING parachute flares with Thor Portable Electric Screwdrivers, light weight favorites of women operators.

SETTING NUTS with a large capacity, heavy duty Thor Electric Nut Setter, easy to handle . . . insuring quick, certain operation.

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DRILLING with the Thor original close-coupled half-inch portable electric drill, compactly built for fast work on heavy jobs.

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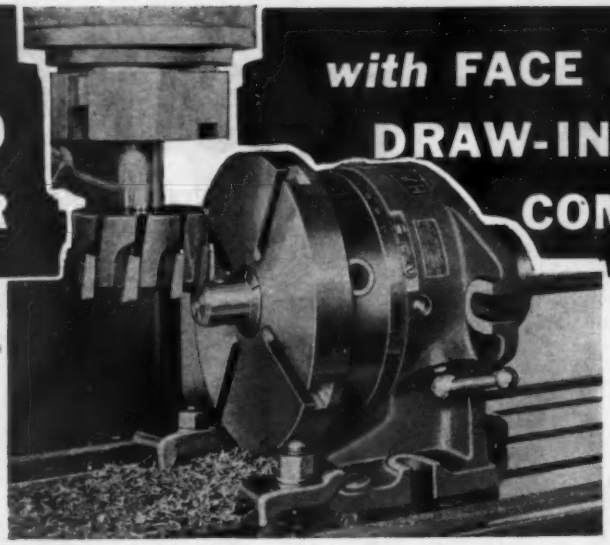
Thor Portable Electric Tools are stocked and sold by leading electrical, automotive, mill supply, plumbing and hardware distributors throughout the world. This guarantees you quick, convenient, reliable service. Write for name of distributor nearest you.

The HARTFORD SUPER-SPACER with FACE PLATE and DRAW-IN COLLET COMBINATION

facilitates many jobs



Explore the possibilities of the "HARTFORD" on your work. Send for bulletin showing a few of the great variety of jobs being done with this versatile, practical device. *Investigate today!*

The utility of this modern indexing device is vastly extended when the SUPER-SPACER is mounted with a face-plate and draw-in collet combination. Its adaptability to the milling of bar stock is shown here.

The HARTFORD SUPER-SPACER can be mounted in horizontal or vertical position and provides the means of speeding up indexing operations on drilling machines, planers, slotters and jig borers as well as on horizontal and vertical millers. No special skill is required on the part of the operator and accuracy is assured under all conditions. Mask plates eliminate all chance of error.

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Universal Centering Chucks quickly convert any medium-sized drill press into a centering tool. Work from screw machines that has been centered on one end can be set on the press and rapidly centered on the other. A feed adjustment regulates the depth of the center so that concentricity and uniform depth of centers are maintained.

A convenient arrangement is provided for quickly removing the center drill and guide bushings. Write for further facts.

UNIVERSAL ENGINEERING CO.
FRANKENMUTH, MICHIGAN

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Quikset

Dual Grip

Ground-Clamp

Alloy-Steel

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QUIKCET for fast (4-second) Clamping—Instant ratchet set and release, fulcrum screw tightening. 1-hand operation and a non-creeping grip even on irregular surfaces. Setting the pace in war production.

DUAL GRIP — Double action malleable clamps. Side tightening for close working conditions. No twisting or creeping.

WELDERS' GROUND CLAMP. Completely copper plated, with connection for ground wire.

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QUICK LOCKCET — For light fast work. Locking lever gib sent and instant trigger release.

OUR 32-PAGE CATALOG illustrates and describes these production clamps in detail. A copy is yours for the asking. *Write Today*

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Appropriate apologies for paraphrasing an old proverb! But isn't it the truth?

There is no provision today for error. There is too much at stake. Highly mechanized warfare staged against a bitter, ruthless enemy demands a constant flow of war machines, flawless in construction and exact in every detail. Gears furnish the vital motive power for these engines of destruction—gears decide whether we can out-shoot, out-fly or out-maneuver the enemy. That is the gear maker's responsibility.

VINCO also has a responsibility: to provide speedy, accurate methods of checking the various phases of gear production. VINCO GEAR ROLLING FIXTURES, VINCO MASTER GEARS and the VINCO INVOLUTE CHECKER are doing a masterful job in helping to maintain peak gear production.

The above insert is a Vinco Gear Rolling Fixture designed to check backlash and run-out on an internal gear—one of hundreds of specially designed gear rolling fixtures that are proving invaluable aids to leading manufacturers in maintaining a high production of precision gears.

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Cutting oil consumption reduced from 4 drums to 2 drums per week. That's what a Model 26 American Chip Wringer did for a Pittsburgh manufacturer* . . . even with business increased and another shift added. Two 55 gallon drums of oil at 50c a gallon . . . a saving of $55 per week . . . $2860 a year.

In less than 3 minutes running time an American Chip Wringer reclaims more than 90% of the cutting oil from metal chips and machine turnings. And any unskilled person can operate it. Savings soon pay for the machine. From then on the savings are added profit. That's an investment worth investigating . . . TODAY!

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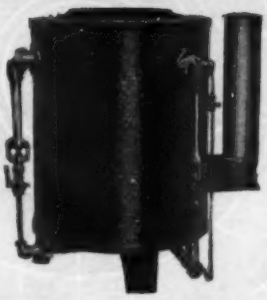
attained quickly with "BUZZER" Semi Muffle Furnaces.
Designed primarily for heat treating carbon steels and pre-heating high speed steels.

NO BLOWER *or* POWER NECESSARY
. . . Just connect to gas supply



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Used for Salt, Cyanide and Lead Hardening. Also adapted for Melting Aluminum.

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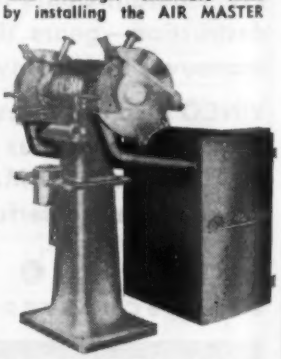
—and their names are DUST and GRIT . . . the dust and grit that flies off your grinders and buffers. These deadly saboteurs injure the lungs of your employees, cause breakdowns of expensive machinery by getting into sensitive moving parts and bearings. Eliminate these destroyers of health and machinery by installing the AIR MASTER at each buffer and grinder.

The Cincinnati AIR MASTER sucks up dust and grit right off your grinder and buffer wheels—and does it right at the moment they fly off the wheels. When the AIR MASTER comes in, dust and grit go out!

Fully self-contained . . . efficient, rugged, dependable. A Size For Every Grinder Or Buffer. *Write today for full details.*

***NOW AVAILABLE:* Two, three and five H. P. grinders and buffers on AA-5 priority or better.**



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ELECTRIC DRILLS • GRINDERS • BUFFERS • PORTABLE TOOLS
The Cincinnati Electrical Tool Co. **3702-5 MADISON RD.**

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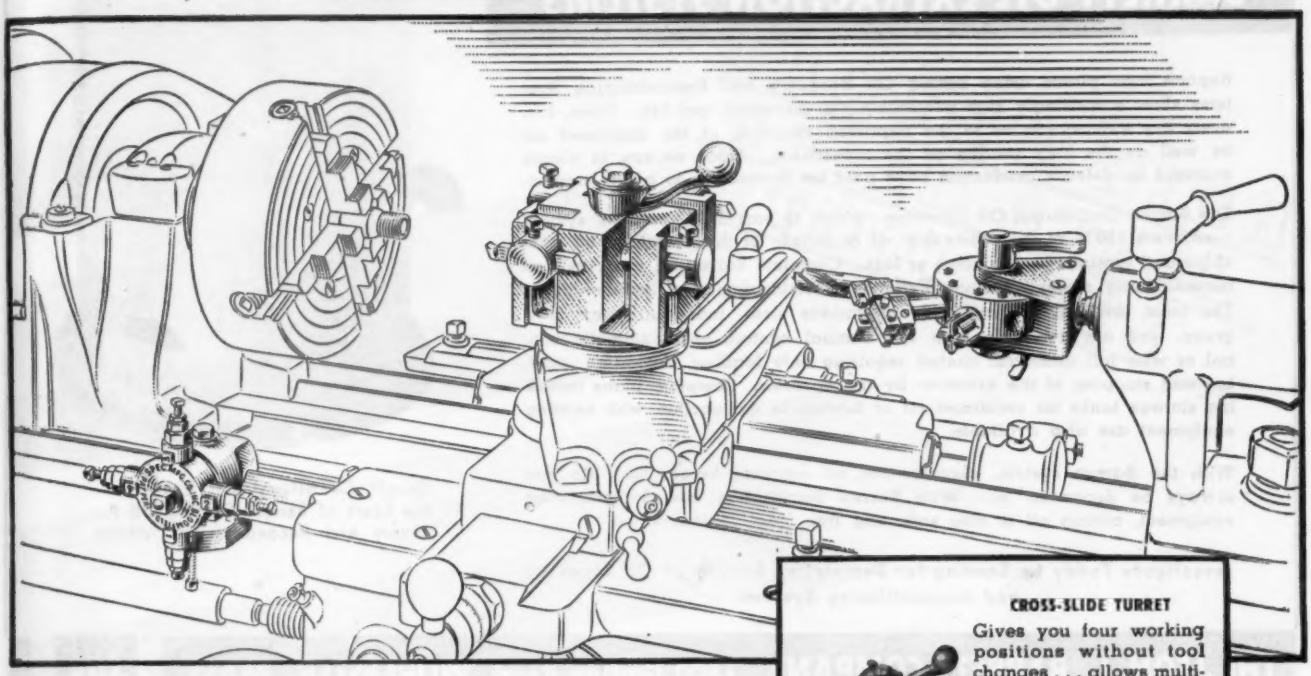

YOUR ENGINE LATHE IS CONVERTED INTO A PRECISION TURRET LATHE WITH THESE 3 SPECIALTIES DEVICES

• You don't have to wait for new turret lathes to speed up production of vital war materials. These time-saving SPECIALTIES lathe accessories, attached to any engine lathe, will multiply the productive capacity of your machine many times—and cut machining costs.

It takes just a few minutes to attach the SPECIALTIES Cross-Slide Turret, Tail-Stock Turret and Lathe Stop—converting your engine lathe into a complete, accurate turret lathe capable of doing any kind of precision machining operation – without stopping the lathe or changing tools.

Mail this coupon for complete information on this flexible SPECIALTIES production team.

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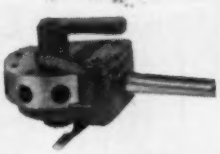
Gives you four working positions without tool changes . . . allows multiple machining operations on one lathe. Easy to operate—merely flip the turret from one position to another. No. 30 for 9" to 12" lathes; No. 60 for 13" to 20" lathes.

TAIL-STOCK TURRET



Quickly converts engine lathe into 4-way turret lathe for end work. You can perform four different operations with the four positions. No. 58 with No. 2 Morse Taper Shank; No. 103 with No. 3 Morse Taper Shank; No. 104 with No. 4 Morse Taper Shank.

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For multiple operations — eliminates repeated measuring. You measure only once for each operation. Once the four positions are set, you just index. No. 10 for 9" to 12" lathes; No. 20 for 13" to 20" lathes.

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as far as the eye can see . . .

through the light haze of this gigantic welding department extend triple rows of C-F Positioners. From this almost endless production line (the photograph is taken from the half-way point) each day come heretofore unheard of numbers of the most modern weapons—each a complex fabrication with all seams, joints and unions strongly and smoothly welded "downhand".

There are no handling problems or delays, for on C-F Positioners each welder positions his weldment for succeeding welds with a pushbutton control—can rotate it at any desired speed (360°) or tilt it to any angle up to 135° beyond horizontal.

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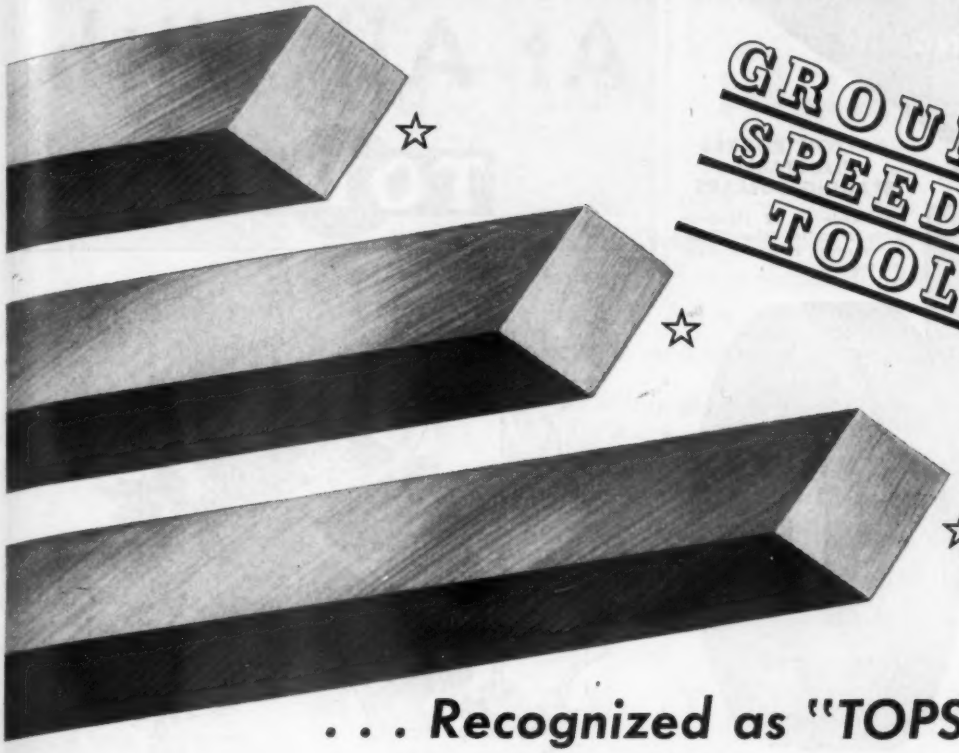

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While it is possible to obtain satisfactory results on a large percentage of materials with Gorham Standard bits, certain hard or abrasive stocks require special alloy tools. To provide adequately for these different applications, Gorham has developed three distinctive cutting materials for tool bits and turning tools.

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For the commercial field.

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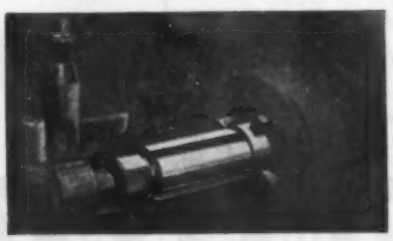

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In one operation TORIT Dust Collectors trap dust at the source and recirculate the clean air back into the room. Each TORIT is a complete portable unit thus eliminating complicated piping. They are readily adaptable, therefore, to any changes that might arise in a production system. For complete information write:

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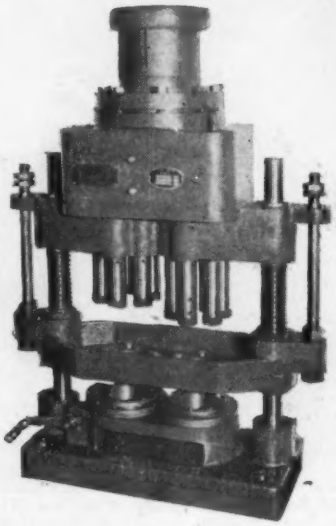
WHEN Buhr HEADS GET TOGETHER
PRODUCTION INCREASES



Buhr Engineers combined a 6-Spindle, fixed center, Drill Head and a 6-Spindle, fixed center, Ream Head in a single Head for drilling and reaming 6⅛" holes in a bearing housing. All spindles have in and out adjustment for spindle wear.

Bushing plate and 2 place Holding Fixture complete this tool-up.

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BUHR MACHINE TOOL COMPANY
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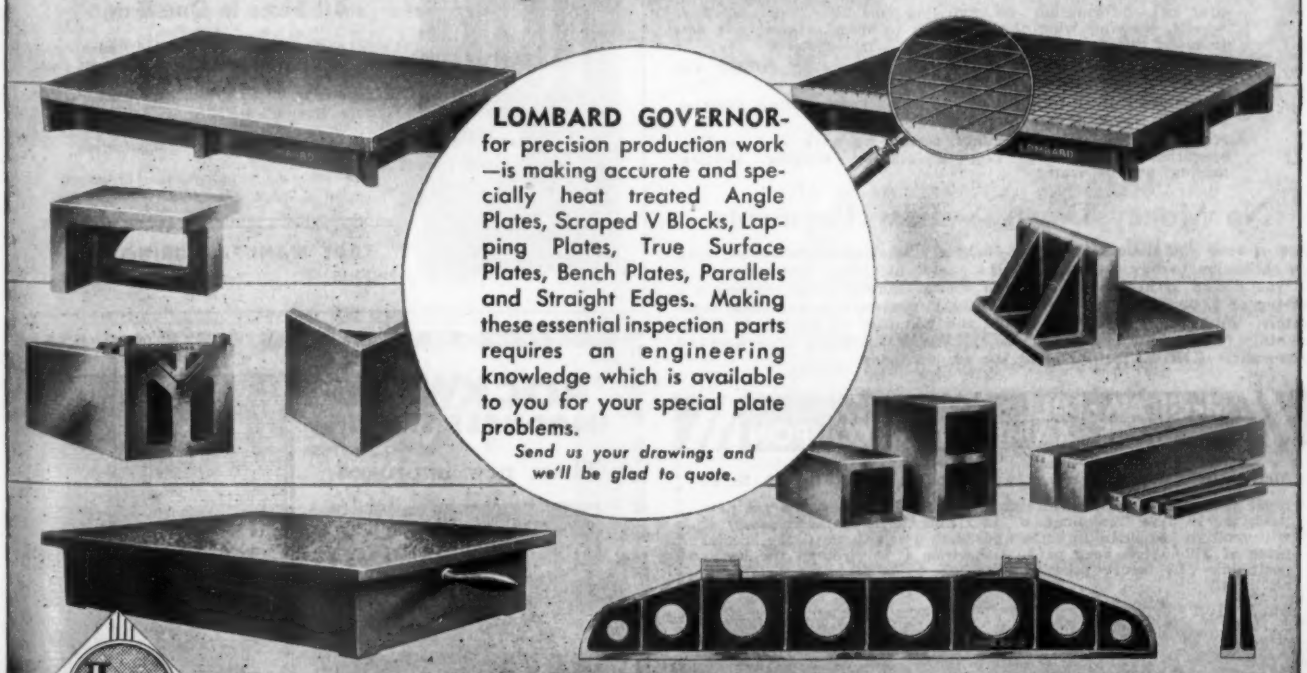

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—practical information on grinding machines and abrasive wheels, showing what they do, how to operate them, and how to make best use of them on various types of work

—training in the various operations performed in drilling and surfacing materials in the machine shop

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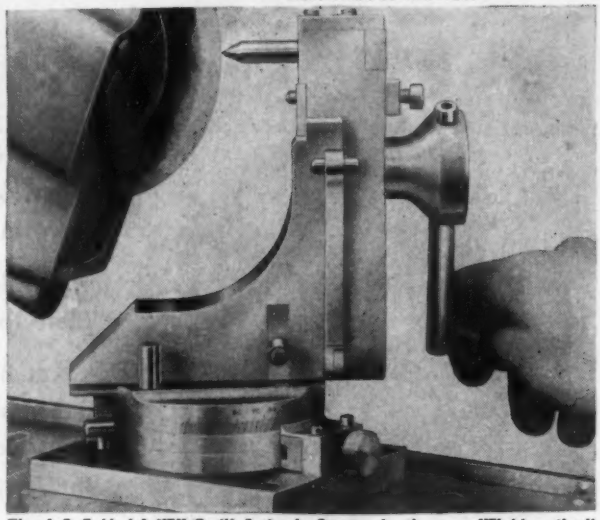
Fluid-motion

for modern form-dressing

ONE SETTING HANDLE CONTINUOUS MOTION



The J & S Model "E" Radii & Angle Dresser in the new "Fluid-motion" series is one of the finest precision dressing instruments procurable—regardless of cost.

FEATURES

Fluid-motion dressing.
.0001" accuracy.
Automatic centering.
Chatterless and dustproof.
14" wheel capacity.
Versatile and adaptable.

J. & S. TOOL CO.

477 MAIN STREET
EAST ORANGE 1, N. J.

EDDY SERVICE GAGES

Style 52
All Sizes in One Gage

Easily changed, set and sealed; each gage in case with complete set of rods for all sizes.

To gage from 0" to ¾" $29.00
To gage from 0" to 1" 35.00

Larger sizes, Price on Application

We make many other styles of gages. Send for folder

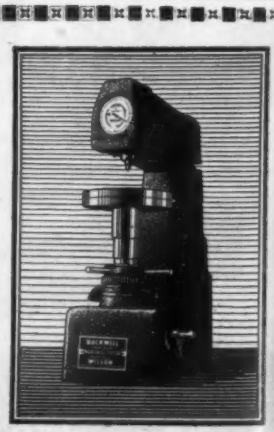
EDDY MANUFACTURING CO.
321 PINE ST. PAWTUCKET, R. I.

"ROCKWELL" HARDNESS TESTER

These new improved type testers available from stock.

Made Only By

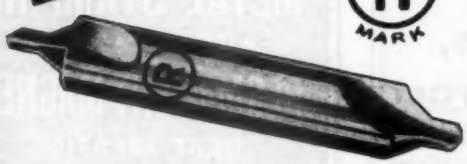
WILSON
MECHANICAL INSTRUMENT CO., INC.
Concord Ave., New York 54



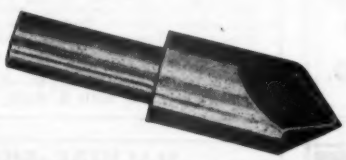
COUNTERSINKING CRANKSHAFTS

CIRCLE-R COMBINATION CENTER DRILLS WERE *"Made to Order"* For This Operation

TRADE R MARK



These drills are coping with one of the toughest crankshaft production jobs in the automotive industry. In this capacity a smaller size combined drill and countersink is used for spotting, followed up with a larger size drill.



CIRCLE-R CENTER REAMERS are helping to boost production in the airplane industry where they are used for countersinking of rivet holes. Circular Tool furnishes the majority of reamers used for this purpose.

Send today for Circular Catalog — K

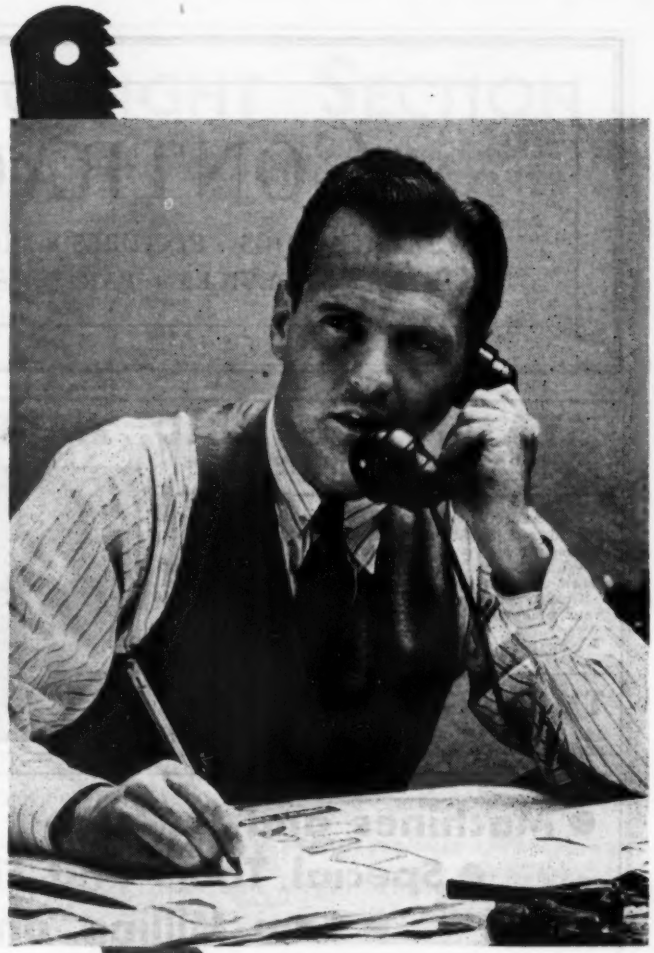
CIRCULAR TOOL CO., INC.

PROVIDENCE 5, R. I.

LOS ANGELES · ROCHESTER · INDIANAPOLIS · DETROIT

CHICAGO · PHILADELPHIA · NEW YORK · DAYTON

CLEVELAND · ST LOUIS



A BARNES BLADE IS BETTER

SOLDIER *in civvies!*

He is an important man in an all-important sector of the war—Supply.

The vital role of American industry in securing final victory is due in no small measure to him.

His tireless efforts in keeping supplies flowing to the production front have contributed greatly to the flow of war materials to the fighting front. . . . He is doing a soldier's job.

* * *

Remember this next time you contact your Mill Supply Distributor. Call him *first* for any staple industrial product.

W. O. BARNES CO. INC.

DETROIT MICHIGAN

CONTRACT WORK

TOOLS • DIES • JIGS • FIXTURES • MOLDS • STAMPINGS • FORGINGS • SPECIAL MACHINERY • DEVICES • PARTS • SCREW MACHINE PRODUCTS • CASTINGS

STAMPINGS AND ASSEMBLIES
IN ALL KINDS OF METALS

Fast and efficient service on long or short runs is guaranteed by our modern equipment and methods, backed by 50 years of experience.
We also offer facilities for the manufacture of screw machine products, tools, dies, jigs and fixtures.
Quality work by skilled mechanics is assured. Send your blueprints or samples today.

"GREATER SAVINGS WITH GREIST"

THE GREIST MFG. CO.
546 BLAKE ST. NEW HAVEN, CONN.

ADDITIONAL FACILITIES FOR CONTRACT MANUFACTURING

Hand screw machines up to 1½ dia.
Turret lathes up to 15" dia.
Milling machines
Engine lathes
Bench lathes
Drill presses
DoALL contour cutting machine

RELIANCE MACHINE & MFG. CO.
30 Irving Place, New York, N. Y.
established 1922

• Machines and Parts,
• Special Tools and Fixtures,
• Cam Milling, on Contract

Your engineering problems will receive efficient and economical service in our modern plant manned with skilled workers. Contact us today for prompt quotations on your blueprints or samples.

Designers and builders of wire and ribbon stock forming machines.

THE A. H. NILSON MACHINE COMPANY, BRIDGEPORT, CONN.

METAL STAMPINGS
• TOOLS • DIES •
PERMANENT MAGNETS
HEAT TREATING
THOMAS & SKINNER
STEEL PRODUCTS CO.
1103 E 23rd St INDIANAPOLIS, IND.

PLANT EMPLOYING 200 PEOPLE HAS PRODUCTION TIME OPEN

- CENTERLESS GRINDERS
- TURRET LATHES
- MILLERS SUPPORTING
- SHAPERS EQUIPMENT

Over 200 Machine Tools

BERGEN MACHINE & TOOL CO., INC.
189 Franklin Ave., NUTLEY 10, N. J.

WIRE AND METAL SPECIALISTS

in round, flat, square and special shaped wire in all metals.
LARGE PRODUCTION CAPACITY
Plating and finishing.
EASTERN TOOL & MFG. CO.
BLOOMFIELD, N. J.

PRECISION FORM GRINDING

Specialists in grinding Circular and Flat FORM-TOOLS, FORM Counterbores, FORM Flat-Drills, and related types of FORM Grinding. Also step-grinding of Tungsten and Molybdenum Rods.

Send Prints for Quotation and Delivery

J. & S. TOOL CO.—477 Main St.—E. Orange 1, N. J.
(Makers of J.&S. Radii & Angle Dressing Tools)

PATTERNS in WOOD and METAL

For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us – we will take care of them.
GENERAL PATTERN WORKS
2233 Buck Street Cincinnati, Ohio

MACHINE SHOP
Wants Subcontract Work

Facilities as follows: turret lathe to 1½" diameter bar, engine lathe 13" swing by 30" center. Also, milling, drilling, and assembling facilities.

WAYNE MANUFACTURING COMPANY
Telephone 442-R Honesdale, Pa.

√ Check this Page . . .

when you are looking for extra manufacturing facilities to meet war-production schedules. Leading concerns advertise their facilities for contract work here, and you can save *time* and *cost* by contacting them.

If you do contract work—and have facilities available — feature your services on this page where more than 24,000 AMERICAN MACHINIST subscribers — active buyers in metal-working — will see your advertisement.

Departmental Staff • AMERICAN MACHINIST

POSITIONS VACANT

These Positions Vacant advertisements are published subject to agreement by the advertisers not to consider applicants now employed on war work unless they obtain written release from present employer.

RIGGER SUPERINTENDENTS & FOREMEN: We are looking for men experienced in handling heavy machinery. Give full experience records. P-827, American Machinist, 330 W. 42nd St., New York 18, N. Y.

A LEADING OKLAHOMA manufacturer of oil field equipment desires to employ a man in the manufacturing department who is capable of handling time studies, work routing, scheduling, and dispatching production. Address applications to M. G. McCool, American Iron & Machine Works Company, Oklahoma City, Oklahoma.

EMPLOYMENT SERVICE

SALARIED POSITIONS—This advertising service of 34 years' recognized standing negotiates for high salaried supervisory, technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission. Retaining fee protected by refund provision. Identity covered and present position protected. Send for details, R. W. Bixby, Inc., 266 Delaware Bldg., Buffalo, N. Y.

POSITIONS WANTED

PERMANENT POSITION wanted as an assistant to a busy executive or as a factory manager by a 47 year old, aggressive, mechanical engineer with excellent shop and organization experience and wide knowledge of production methods, processing and tool design. Position must afford plenty of responsibilities. Married, one son and able to locate on short notice. Record and references on request. Perfect knowledge of Russian, French and German languages. PW-806, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

ENGINEER: Graduate industrial, journeymans papers in toolmaking. Desire executive position in war work with post-war future. Employed past three years as tool engineer in ordnance and aircraft work. Age 28, married, draft status 2B. PW-837, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

TOOL SUPERVISOR available; will cut costs, solve manufacturing difficulties, simple, effective tools. PW-829, American Machinist, 330 W. 42nd St., New York 18, N. Y.

SUPERINTENDENT—general foreman of machinery or tool departments. General machine shop foreman 285 men, 10 subforemen, 14 years; tool and maintenance department foreman 10 years; preceeded by 10 years practical shop experience. Designed 2,000 jigs; knowledge of time study, job evaluation, gear hobbing, herringbone gear cutting, horizontal and vertical mills, lathes, planers, shapers, turrets, and miller. Harmonious labor relations, 56 years of age, sober, over 17 years in present position, in good standing, termination at my request and in order. PW-850, American Machinist, 330 W. 42nd St., New York 18, N. Y.

PLANT MANAGER—Superintendent. Age 42, extension school engineering graduate, experienced. Shop manufacturing methods, low cost production, research, design, wage structures, tools, jigs and fixtures. Light and heavy manufacture. Permanent connection. PW-848, American Machinist, 330 W. 42nd St., New York 18, N. Y.

SUPERINTENDENT. Twenty-five years experience in supervision. Modern methods of tooling and production of medium to large size machinery. Familiar with standards, cost control, foreman training, incentives, etc. Promoter of the "We attitude." Seeks permanent post-war connection. Available. PW-845, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

MANAGEMENT ENGINEER available due to sale of business. Extensive experience in business administration, costs, production, methods and products. Married. University graduate. PW-844, American Machinist, 330 W. 42nd St., New York 18, N. Y.

WANTED—connection as assistant to shop executive in research and development or production. Age 47, with experience in shop management, development and light manufacturing. Prefer central or southern location. Must have post-war program and chance to advance. PW-847, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT : "OPPORTUNITIES" : EQUIPMENT
BUSINESS : : USED OR RESALE

UNDISPLAYED —RATES— DISPLAYED

10 CENTS A WORD. MINIMUM CHARGE $2.00
Positions Wanted (full or part time individual salaried employment only) ½ the above rates payable in advance.
Box Numbers—Care of publication New York, Chicago or San Francisco offices count as 10 words.
Discount of 10% if full payment is made in advance for 4 consecutive insertions.

Individual Spaces with border rules for prominent display and advertisements. The advertising rate is $6.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.
An advertising inch is measured ⅞" vertically on a column—3 columns—30 inches to a page.

ASSISTANT WORKS MANAGER WANTED

Assistant Works Manager wanted for a Diesel engine plant employing approximately 2000 men.

In addition to broad shop experience, must be skilled in handling all other problems including labor relations.

Those employed at their highest skills in war work will not be considered.

State experience and salary required.

Apply P-838, AMERICAN MACHINIST
330 WEST 42nd STREET NEW YORK 18, N. Y.

WANTED
MASTER MECHANIC

To take complete charge of Maintenance and construction including the operation of a machine shop, pipe shop, millwright force and boiler repairs in chemical plant employing 300 people located near Philadelphia.
Must be between 35 and 45 years of age and have well rounded experience. If interested give full information on training, experience, personal history, salary expected and enclose recent photograph in first letter. Applicant must be able to furnish certificate of availability if accepted.

P-851, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

PRODUCTION MAN

Wanted by old established builder of high grade machinery, with highest rating. Permanent connection and unusual opportunity for advancement for experienced producer. Plant and equipment is modern and working conditions congenial. Now on war work but has broad line of nationally recognized post war products. Give particulars as to experience and previous responsibilities. Address

P-841, American Machinist
330 W. 42nd St., New York 18, N. Y.

(POSITION VACANT)
IN CALIFORNIA—DRAFTSMEN AND DESIGN ENGINEERS

Desiring permanent position with well-established manufacturer of small high-speed machines. Leader in industry with future development program always in progress. Must have good background in design of small intricate production parts. If so qualified and interested give background. Apply:
P-811 AMERICAN MACHINIST
68 Post Street San Francisco 4, Calif.

WANTED — TOOLMAKER

who has had enough experience to take charge of tool room on special machine tools, jigs, fixtures, and gages, for our own plant. Excellent post-war opportunity for man who desires to get connected with a progressive concern established in 1933. Factory located on beautiful Lake Shore Drive, in southwestern Michigan. Give all details and salary expected in first letter.
P-701, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

POSITION WANTED

Industrial Engineer desires position as master mechanic or assistant to master mechanic with American firm preferably in South America. 25 years experience in manufacturing aircraft, auto, Marine and truck Gasoline Engines. Including 10 years machine tool building and maintenance, tool trouble and process Engineering.

PW-826, American Machinist
520 N. Michigan Avenue
CHICAGO 11, ILL.

WANTED
TOOL ENGINEER

Large National company in a specialized industry desires an experienced tool designer for jig and fixture work. Permanent position; good future; attractive salary; excellent post war opportunities. Plant located in Massachusetts between Providence and Boston. Address

P-843, American Machinist
330 W. 42nd St., New York 18, N. Y.

ADDITIONAL EMPLOYMENT AND BUSINESS OPPORTUNITY ADVERTISING ON PAGE 296.

SEARCHLIGHT SECTION

SALESMAN WANTED

(Continued from preceding page)

ENGINEERING GRADUATE with mechanical experience needed now to prepare for excellent post-war sales opportunity. Draft exempt man under 45 years of age preferred. Write full particulars to W-43, P. O. Box 3575, Phila, 22.

SALESMAN for metropolitan New York, precision tools and tool holders. Experience in the use of these tools or knowledge of them necessary. Salary and commission. SW-849, American Machinist, 330 W. 42 St., N. Y. 18.

REPRESENTATIVE AVAILABLE

DO YOU need Detroit or Michigan sales representation? Organization selling industrial accounts. Interested in lines with post-war potentialities. Warehouse facilities can be arranged RA-846, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

PATENT ATTORNEY

PATENTS, COPYRIGHTS, Booklet, "General Information concerning Inventions and Patents" and "Fee Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 453, 815-15th St., N. W. Washington, D. C.

CONTRACT WORK

MANUFACTURING FACILITIES WANTED: Forging, cold heading or punch press shop wanted to make several million pocket knife bolsters for us. Write for samples. Union Cutlery Co., Inc., Olean, New York.

WANTED

SALES AGENT

or distributor for prominent diamond tool manufacturer. Exclusive territories available. Write giving full details.

SW-842, AMERICAN MACHINIST
330 West 42nd Street, New York 18, N. Y.

WANTED

MACHINE AND TOOL SALESMEN

EXCEPTIONAL OPPORTUNITY FOR HIGH GRADE EXPERIENCED MEN TO EXPAND INCOMES HANDLING HIGH QUALITY WELL KNOWN CUTTING OILS AND LUBRICANTS. FULL COOPERATION ASSURED. ATTRACTIVE COMMISSION. *WRITE COMPLETE DETAILS.*

SW-840, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

NEW INVENTIONS WANTED

Mechanical and electrical devices for post-war manufacture and sale. Either new ideas, or improvements upon present methods.

P. O. Box 217, Denville, N. J.

DO YOU NEED ENGINEERS TO DESIGN OR RE-DESIGN YOUR PRODUCTS?

Our Product Design Department has engineers experienced in creative design of new products and for the modernizing of old.

Our two Plants are furnishing the following Engineering Services to many Companies throughout the U. S. A.

Lofting	Tool Procurement
Tool Processing	General Drafting
Aircraft Designing	Electrical Layout
Tool Designing & Detailing	General Plant Layout
Machine Designing & Detailing	Piping & Structural Layout
Sheet Metal Layout For Aircraft	Ventilation & Air Conditioning

Product Designing and Development

Whether your Engineering or Designing problems are large or small, allow us to submit a proposal on your work.

H. L. YOH COMPANY
PRODUCT DIVISION

740 Sansom Street **Philadelphia, Pa.**

WE WANT . . . TAPS TWIST DRILLS — FILES CUTTERS — END MILLS SAWS — HACK SAW BLADES.

WE BUY SURPLUS STOCKS OF TOOLS.

SURPLUS TOOL EXCHANGE
617 W. Randolph St., Chicago 6, Ill.

SHEET METAL MACHINERY

NEW and USED—Hand and Power Brakes, Shears, Forming Rolls, Folders, Punches, Rotary Machines, Stakes, Spot and Arc Welders

MONA MEMBER

B. D. BROOKS, INC.
361 Atlantic Ave., Boston, Mass.

MACHINES WANTED

WE WISH TO PURCHASE

1 small double stroke solid die heading machine.

1 inclined thread rolling machine with hopper, (suitable for No. 0 screws).

1 Baird or Nilson small four slide machine.

We are interested only in machinery in excellent condition, for which we will pay top market prices.

Write immediately to

W-839, AMERICAN MACHINIST
330 WEST 42nd STREET **NEW WORK 18, N. Y.**

SCREW MACHINES

NEW BRITAIN ⅝", 1", 1⅜" six spindle auto, M.D.

YODER continuous roll forming machines, all sizes.

CLEVELAND ¾" cap. single spindle.

BLISS & ADRIANCE single and double action pressure.

MONA MEMBER

National Machinery Exchange
"If It's Machinery—We Have It"
134-138 Mott St., NEW YORK, N. Y.

STEAM DROP HAMMER—1500#
6" AJAX FORGING AND UPSETTING MACHINE, MD
PLATE PLANER—Hilles & Jones 15 ft.
BULLDOZER—#7 AJAX Crosshead 14" x 64"
HIGH SPEED SAW AND BURRING MACHINE—Ajax #3 30"
PIPE BENDING MACHINE—Hydraulic—Capacity 8" Extra Hy. Pipe
SANDSLINGER—Beardsley & Piper Motive Type 7 cu. ft. capacity
H. J. KOONTZ, Massillon, Ohio, Phone 8180

FORGING MACHINERY

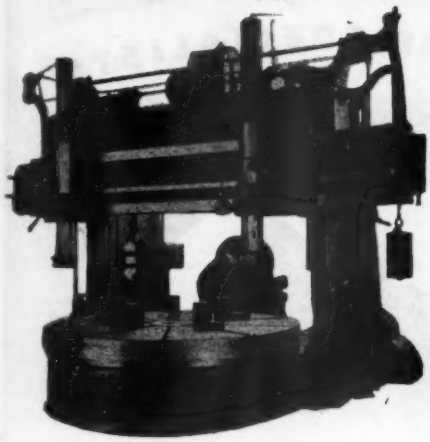
(STILL OPERATING—TO BE RELEASED)

STEAM DROP HAMMERS—4000#—3 yrs. old
STEAM DROP HAMMERS—3000#—3 yrs. old.
STEAM DROP HAMMERS—2000#—3 yrs. old
BOARD DROP HAMMERS—3000#—10 yrs. old
BOARD DROP HAMMERS—2000#—3 yrs. old
BOARD DROP HAMMERS—1500#—10 yrs. old
#5 AJAX FORGING ROLLS, M.D. 75 H.P.
6" AJAX UPSETTER

FS-825, AMERICAN MACHINIST
520 N. Michigan Ave. Chicago 11, Ill.

IMMEDIATE DELIVERY

"FALK" for DEPENDABILITY in Rebuilt Machinery



100" Niles-Bement-Pond Boring and Turning Mill.

BORING MILLS

Vertical, 48" Gisholt.
Vertical, 52" Colburn.
Vertical, 42" "New Era" Bullard.
Vertical, 60" Colburn.
Horiz. #36 Landis-Rochester, 3½" Bar Floor Type—Floor Plate 72" x 120".

COMPRESSORS

Ingersoll Rand 100' Free Air.
15 hp. Direct connected Motor Drive A.C. 60 cyc.

RADIAL DRILLS

3' Arm Dreses 10" Round Column.
4' Arm Cincinnati Bickford.
5' Arm 11" Rd. Col. Cincinnati Bickford.
5' Arm 18" Rd. Col. Cincinnati Bickford, air clamp.
7' Arm 15" Bickford.

MILLING MACHINES

No. 3 Cincinnati, High Power, Plain with Vert. Head & Rotary Table, M.D.
No. 5 Cincinnati, High Power, Plain, S.P.D.
No. 4 Cincinnati, High Power, Plain, S.P.D. (2).
No. 3 Cincinnati, High Power, Vertical.
No. 2 Cincinnati, High Power, Plain.
No. 2 Cincinnati, Moterized, Pyramid Col.
No. 2 Brown & Sharpe, Plain (10).
No. 1½ Brown & Sharpe, Plain (2).
No. 1½ Valley City Universal, Cone Dr.
No. 1 Brown & Sharpe, Plain (6).
No. 12 P & W Lincoln Type Production (2).
No. 00 Bickett Hand Miller.
No. 0 Bickett Vertical Bench Miller.
Ames Precision Universal Bench Mill.
P & W 2" Duplex Spline Miller.
Hall Planetary Thread Miller 24"
No. 3 Lees Bradner Thread Miller.

ANGLE BENDING ROLL

Bertsch 3" x 3" x ⅜".

PLANERS

120" x 72" x 35' Betts, 4 Heads, M.D.*
72" x 72" x 18' Pond Heavy Pattern, 4 Heads.
48" x 48" x 12' Putnam Heavy, 2 Heads, M.D.
30" x 30" x 12' Americas M.D., 2 Heads.
30" x 30" x 10' Cincinnati Heavy Pattern, 2 Hds.

PLANER - SHAPER

20" x 20" x 36" Niles-Bement-Pond, M.D.

SHAPERS AND GEAR CUTTERS

15" Queen City M.D.
7" Rhodes Horiz. High Speed, Belt Dr.
26" Cincinnati Triple Geared Belt Dr.
#612 Fellows 36" Gear Shapers, (2)
24" Schuchart & Schulte.

GRINDERS

#13 Brown & Sharpe Universal and Tool.
12" Parsons-Arter Rotary Surface Grinder.
16" Heald Rotary Surface Grinder.
12" Heald Rotary Surface Grinder also equipped with 9" Dia. Permanent Magnetic chuck.
#2 Brown & Sharpe 10" x 30" Univer. Cylindrical Grinder.
#2 Cincinnati Centerless Grinder, Filmatic.
24" x 136" Landis, Univ. Cylindrical Grinder.
#12 Greenfield Hydraulic Internal Grinder.

BRAKE

#208 Dries & Krump Apron Type, Motor Dr., 10' x 11 Ga.

AUTOMATIC

Davenport Model "B" High Speed, 5 spindle 9/16" cap. Threading spindle, complete, perfect condition.

LATHES

Monarch 16" x 8' Q. C. G. with Taper Attachment and Chuck.
South Bend 16" x 6' Motorized Gap Lathe.
Lodge & Shipley 20" x 10' 12 speed geared head, M.D.
Rockford 16 x 6 Toolroom Lathe, Taper, Chucks, M.D.
LeBlond 21 x 8 High Duty, Taper, Chuck, M.D.
LeBlond 21" x 16' High Duty, Taper, Chuck, M.D.
Schumaker & Boye 24" x 10' QCG**, Taper, Chuck, Belt Dr.
Putnam 26 x 12 Heavy QCG, arr. for M.D.

Headquarters for Punch Presses

THIS IS A PARTIAL LISTING OF OUR STOCK. SEVERAL HUNDRED ADDITIONAL ITEMS IN STOCK. SEND US YOUR INQUIRIES.

** Quick change gear

* Motor Driven

Buy from Stock

MACHINERY

Tel. Main 6347-6348

FALK

MACHINERY CO.,

18 WARD ST.

MERCHANTS

ROCHESTER 5, N.Y.

. . . IN THE DISTRIBUTION OF

Used and Rebuilt Machine Tools

This is an age of specialization. American industry owes much of its growth to the fact that each stage of an industrial operation has been managed by men trained to do one job superlatively well.

The distribution of used machine tools is a *big* and *specialized* industry. Distributors must know market conditions, both local and national. They must know how and what available machine tools can be recommended to fit the production requirements of the customer.

America's leading used machine tool distributors, united in MDNA, offer both government and industry an efficient experienced method of distribution of available surplus machine tools.

SECOND WARTIME CONFERENCE OF MACHINERY DEALERS NATIONAL ASSOCIATION WILL BE HELD AT HOTEL PENNSYLVANIA, NEW YORK CITY, JUNE 5th and 6th, 1944

The MDNA insignia is a pledge by the used machine tool dealer who displays it that he conducts his business relations in a spirit of fair play to his customers and competitors.

MDNA
MEMBER

MACHINERY DEALERS NATIONAL ASSOCIATION

20 NORTH WACKER DRIVE **CHICAGO (6) ILLINOIS**

. . . IN STOCK

AUTOMATICS

7/8" Cleveland Model M, four spindle
1¼" Gridley Model G, four spindle
7/8" Gridley Model G, single spindle
¾" Gridley Model F, four spindle
2⅝" Gridley Model F, four spindle
3¼" Cleveland Model A, single spindle
No. 00 Brown & Sharpe, single spindle

DRILLS

24" Superior Upright, p.f.
4 ft. Dreses Radial, s.p.d.
No. 310 Baker, single spindle
24" Barnes Camelback, single spindle
Leland-Gifford, Sensitive, three spindle
No. 11 Natco Multiple Spindle
No. 13 Natco Multiple Spindle

GEAR CUTTERS

No. 6 Fellows Gear Shaper, m.d.
30" x 10" Maag Gear Shaper, m.d.
No. 10 Lees Bradner Gear Grinder, m.d.
No. 3 Brown & Sharpe Automatic Gear Cutter
30" Consolidated Gear Tooth Rounder
96" Gleason Spur & Bevel Gear Planer

GRINDERS

No. 72A3 Heald Gagematic
No. 75 Heald Internal
No. 3 Landis Universal
22" x 48" Pratt & Whitney Surface
30" Diamond Face, 84" table travel
No. 2 Wilmarth & Morman Surface
No. 12 Brown & Sharpe Cutter
No. 1½ Cincinnati Cutter
No. 2 Sellers Carbide Tool

LATHES

14" x 6' American, c.d.
14" x 10' Pratt & Whitney, c.d.
18" x 15' Schumaker, Boye & Emmes, c.d.
22" x 10' Lodge & Davis, c.d.
29" x 14' Schumaker, Boye & Emmes, c.d.
8" x 60" Fitchburg Lo-Swing, q.h.

TURRET LATHES

24" Bullard New Era V.T.L., m.d.
12" Bullard Mult-au-Matic, m.d.
No. 4A Warner & Swasey, 7¾" Hole, Timken
No. 1A Warner & Swasey, m.d.
No. 2A Warner & Swasey, m.d.
No. 1B Foster, m.d.
2¼" x 24" Jones & Lamson, M.D. (serial over 40,000)

MILLS

No. 2 Rockford Plain, m.d.
No. 1 Garvin Universal, c.d.
No. 2 Kempsmith Vertical Maximiller, m.d.
No. 3 Brown & Sharpe Vertical, m.d.
Model C Becker Vertical, m.d.
Model B Gooley & Edlund, c.d.
No. 12 Brown & Sharpe, c.d.
144" Betts Vertical Boring Mill, 2 head, m.d.
4" Fosdick Horizontal Boring Mill, m.d.
Pratt & Whitney Spline Mill

MISCELLANEOUS

16" Betts Slotter
100 lb. Bradley Helve Hammer
No. 2 Crescent Table Saw
12" Crescent Jointer

PLANERS & SHAPERS

24" x 24" x 8' American Planer, one head
30" x 30" x 12' Ohio Planer, one head
48" x 48" x 12' Cincinnati Planer, 4 heads
72" x 56" x 20' Cincinnati Hypro, 4 heads
96" x 96" x 25' Detrick & Harvey Open-side Planer, 4 heads
20" Ohio Shaper, s.p.d.

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DEFIANCE No. 25A Horiz. Boring Mill—3¾" bar—Built in 1941
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BULLARD 60" Vertical Boring Mill
BULLARD 24" R.P. Vert. Turret Lathe
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N.B.P. 48"x36"x14' Planer; 3 heads; belt drive
GRAY 24"x24"x6' Single Head Planer
GRAY 72"x48"x12' Planer — two heads; belt drve
HAMILTON 42"x42"x20' Planer; 3 heads; DC motor drive
LUCAS 3" bar Horiz. Boring Mill; M.D.
D. & H. 3½" Bar Horiz. Boring Mill
CINCINNATI #2 Vert. Miller, M.D.
LEES BRADNER #6 Thread Miller
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AMERICAN 3' Radial Drill — motor on arm, triple purpose
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LANDIS 20"x220" Plain Grinder;
LANDIS #3½ Int. Hydraulic Race Grinder
DIAMOND #4 Surface Grinder; Hyd. Feeds
HEALD #60 Internal Grinder; M.D.
GLEASON 6"-18" Bevel Gear Generators
ESPEN LUCAS No. 138 Cold Saw — Cap. 12"
SAUNDERS 8"-18" Pipe Threader
TREADWELL 12" Pipe Machine
GISHOLT Precision Balancer
100 Ton Horiz. Hydraulic Forcing Press
CINCINNATI Gear Burnisher; M.D.
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4 spindle 7/8" Cleveland Model M, m.d.
No. 22, 23, 33 New Britains, m.d.
2¼" Cleveland Model A, m.d.
2¼" Gridley, m.d.
2½" Cleveland Model A, m.d.
3¼" Gridley, m.d.
4¼" Cleveland, Model A, m.d.
6" Cleveland Model A, m.d.

HORIZONTAL BORING MILLS

No. 31 Lucas 3" bar, m.d.
3½" bar No. 1BE Blomquist & Eck, m.d.
3½" bar Rochester, m.d.
4" double spindle Barrett, m.d.
4" Niles, m.d.
4" Detrick & Harvey Floor Type, m.d.
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No. 0 Fosdick, 3" bar

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42" Colburn, 2 heads, m.d.
42" Niles-Bement-Pond Car Wheel Borer
48" Cincinnati Rapid Production, 1 turret, 1 swivel head, m.d.
60" Gisholt, 2 heads, m.d.
60" Niles, 2 heads, m.d.
10' extended to 16' Betts, m.d., 2 heads
12" Niles-Bement-Pond, 2 heads, m.d., p.r.t.
72" King, 2 rail heads, 1 side head, latest type

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No. 2 Baush, 16x30" rect. head, No. 2 spindles
No. 2 Baush, 16x30" head, hydraulic feed, No. 2 spindles
No. 2 Baush, 16x30" head, tapping attach., No. 3 spindles
No. 3 Baush, 16x30" head
No. 3 Baush, 20x40" head
No. 11 Pratt & Whitney, 14x9" head
C20H Natco, 30" round head, No. 4 Taper, 16 spindles
No. 22AC Fox, 16" round head
No. 26C Fox Tapper, 54 spindles No. 1 Taper
3 spindle 12" Rockford Gang Drill
4 spindle Harrington H.D. Rail Drill

HORIZONTAL DRILLS

No. 00S Garvin Duplex
Love Bros. No. 4 Taper, 15" horizontal travel
Pratt & Whitney Rifling Machine
5 spindle Detroit
8 spindle Hammond, hydraulic feed

RADIAL DRILLS

2' American Triple Geared
2½' Carlton Sensitive
3' American Sensitive
3' Carlton Sensitive
3' Cincinnati Bickford Plain
3' Fosdick Sensitive
3' Western Plain
3½' Cincinnati Bickford Plain
4' Cincinnati Bickford Plain
4' Niles-Bement-Pond Semi-Universal
4' Western Plain
5' American Triple Geared
5-17" column Cincinnati Bickford Super-Service, m.d. on arm
5' Niles-Bement-Pond Full Universal
5' Prentice Plain
6' Niles-Bement-Pond Semi-Universal
6' Reed-Prentice Plain
7' American Triple Purpose, m.d. on arm

UPRIGHT DRILLS

20" Cincinnati
22" Barnes All Geared-Self Oiling
24" Cincinnati
24" Hoefer
24" Sibley
No. 310 Baker H.D.

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Type A Barber-Colman, m.d., latest type
No. 12 Barber-Colman Double Overarm, m.d.
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No. 3 Barber-Colman Hobber, m.d.
No. 3-26" Cincinnati Spur Gear Cutter
No. 3-26", 3-36", 3 Heavy, 3-36", 4-36", 4-48"; 6-60", 6-72" Brown & Sharpe Spur Gear Cutters
48" Cleveland Gear Hobber
No. 72 Fellows High Speed Gear Shaper, m.d.
11" and 18" Gleason Straight Bevel Gear Generators
30" Brainerd Gear Cutter
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- #0 FOSDICK Horizontal Boring, Drilling & Milling Machine, M.D.
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- 7' AMERICAN Universal Radial Drill, M.D.
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- 42" PUTNAM Double End Car Wheel Lathe, M.D.
- #3-B MILWAUKEE Plain Miller
- #2 CLEVELAND Plain Miller
- #10 NILES Vertical Milling Machines
- #6 BECKER Vertical Milling Machine
- 30"x30"x10' NEWTON Slab Miller
- 12" Wm. SELLERS Slotters
- 20" SELLERS Crank Slotter, M.D.
- 12"x12" ACME Power Hack Saw, M.D.
- 48"x48"x24' N.B.P. Heavy Planer, Two Rail, One Side Head, M.D.
- 48"x48"x20' PATCH Planer, 4 heads, 230 volt D.C. Rev M.D.
- 24"x24"x6' WHITCOMB Planer, 230 volt D.C. Reversing M.D.
- 42"x48"x12' SIMMONS Openside Planer, 230 volt D.C.
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- 6"x6⅝" SOUTHWARK Double Angle Shear
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- 60" Throat, 8" x 1 1/16 LONG & ALSTATTER Shear
- 54" Throat 1¾"x1⅛" HILLES & JONES Punch
- 42" Throat, 1¾"x1" HILLES & JONES Punch, M.D.
- 4" LANDIS Pipe Threading Machine
- 6" BIGNALL-KEELER Improved Pipe Machine
- 10" STANDARD Pipe Threading Machine
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VERTICAL

120" Niles
42" Bullard, turret head, swivel head
54", 62" Colburn, M.D.
36" Bullard V.T. L., side head

HORIZONTAL

2½" Universal, Binsee
4" Dietrich & Harvey Floor, M.D.
4" Binsee
4½" Bement-Niles

TURRET LATHES

26" Libby, 7½" hole
18" Libby, 3½" hole
24" Gisholt, 6½" hole
Foster No. 1B, M.D.
Foster Nos. 4, 5, 6
W. & S. Nos. 2, 4, Universal, M. D.
Gisholt Automatic, M.D.
J. & L. 2¼x24", 3¼x36"
Acme 3¼x36" grd. head

GRINDERS

P. & W. 14", 18", B.B. vert., M.D.
Blanchard 26", 30" M.D.
Modern 12x48", M.D.
Norton Hydraulic 12x18", M.D.
Heald Nos. 55, 72A Internal, M.D.
Norton 50"x28', M.D.
Gardner 72", Disc, M.D.

LATHES

48"x12' Harrington Gap Sid. Bed
McCabe 26-42"x14'
26"x24' Putnam 3 step cone, D.B.G.
24"x12' Boye & E. 3 step cone, D.B.G.
20"x14' Rahn-Larmon, raised to 24"
16"x8' Lodge & S. Grd. hd., taper, M.D.
14"x6' Hendey tie bar, taper
14"x6' Mulliner, taper, collets

AUTOMATICS

Cleveland Model A, ½", ⅝", 1¼", 2"
Cleveland Model B, 1", 2"
Gridley 1¼", 2¼" 4 spindle
Cleveland ⅞" Model M, 4 spindle
Gridley 4¼", single spindle, M.D.
B. & S. Nos. 00 OG, 2G
P. & J. No. 6A, M.D.
New Britain, 1⅝" x 7", six spindle

SHAPERS

14" P. & W., M.D.
20" Stockbridge
20" G. & E., S.P.D.
26" Stockbridge, M.D.

GEAR CUTTERS

B. & S. Nos. 3-26", 4-36"
Gleason 11" Bevel
Pfauter No. 3 Gear Hobber, 59" cap.

MILLING MACHINES

Providence Planer Type 32"x8'
Nos. 2, 3, 4, B. & S., and Cincinnati Plain & Univ.
Becker Nos. 3, AB, 5, 6 Vert.
Nos. 3, 4, Cincinnati Vert.
P. & W. No. 12 Profiler, M. D.
No. 2 Kent-Owens
No. 3 LeBlond-Universal
Hall Planetary Thread Miller, Model D

RADIALS

4' American Triple Purpose
8' American Triple Purpose, M.D.
5' Dreses, Full Universal
3' Cincinnati-Bickford
2½' American
4' Mueller, M.D.
4', 5' Western, S.P.D.

MISCELLANEOUS

Pels 6' throat punch
P. & W. 6" Vert. shaper
Marvel Metal Band Saw, M.D.
McCabe ½" Flanger
Pipe Machines, 2", 4", 6", 8", M.D.
N.B.P. 15" Slotter, M.D.
No. 30 Natco Multiple Spindle Drill
Pottstown Tappers
150 ton United Steam Hammer
Hall Planetary Thread Miller

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BORING MILLS
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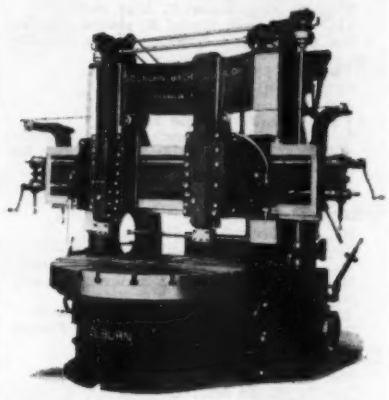

Colburn 60" Vertical Boring and Turning Mill

SPECIFICATIONS: Swing 62". Maximum distance under cross rail, 46". Table diameter, 60". Vertical travel of rams, 32". Diameter ram tool holder shanks, 3½". Vertical travel of turret slide, 26". Maximum distance under turret, 53". Net weight, 24,000 lbs.

Bullard 36" New Era Vertical Turret Lathe

Capacity, 38" in diameter; 24" in Head under cross rail; 35" under Turret Face. Table 34" in diameter. Table speeds, twelve changes ranging from 4 to 70 R.P.M. Side head—M.D. Vertical movement of 26" will face 38" wt. 14,000 lbs.

HORIZONTAL

3½" Universal Horizontal Boring Mill, Motor Driven

Diameter of main boring bar.....3½"
Taper hole in main boring bar, Morse #6
Number of spindle speeds, 16
Size of Table, 30" x 48"
Great distance from Face Plate to Outer Support, 84"

3A Universal Horizontal Boring Machine, Motor Driven

Diameter of main boring bar, 3'
Taper hold main boring bar, Morse #5
Size of Table 24" x 48"
Greatest distance from Face Plate to Outer support, 60"

Cleveland No. 1 Horizontal Boring and Milling Machine, Motor Driven

Spindle diameter, 2½"
Morse Taper Hole, #5
Greatest distance from Face Plate to Outer Support, 3'
Table 20" x 42"

Niles Horizontal Boring and Milling Machine, Motor Driven

Duplex #72 Motor Driven
Spindle diameter, 4½"
Spindle Travers, Double, 60"
Maximum distance spindle end to outer bearing, 84"
Table Length, 60"
Table Width, 33"

Beaman & Smith 5" Floor Type Motor Driven Boring Mill

The Platen is 72" wide, 11½' long, 42" high; has 8 tee slots. The Spindle is 5" diameter; has a No. 6 Morse taper hole. Bed of 72", head on it a vertical movement at 3', 6". The Bed supporting spindle column is 49" wide, 11', 6" long; saddle on bed 66" long; head on column 25½" wide, 54" long. Capacity: From center of spindle to platen, greatest distance is 5' 6", the least 24"; has 3' 6" vertical and 72" horizontal movement; greatest distance from large driving gear to outer support is 10', the least 3'.

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of Mass. Inc.
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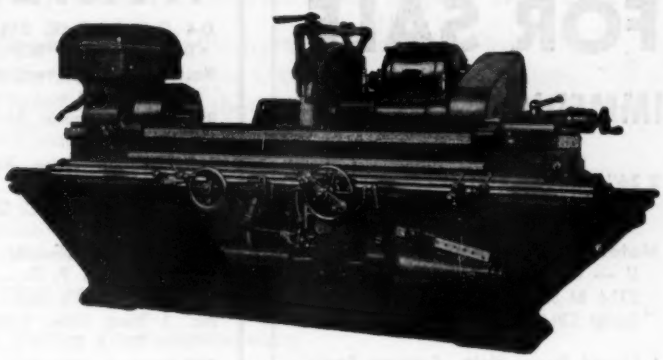
CYLINDRICAL GRINDERS *for* SUPER-GRINDING *and* MICRO-FINISH



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10x36	14x36	16x50
10x50	14x50	18x96
10x72	14x72	18x168

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Have you any NORTON grinders you wish modernized and motorized?

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9' Pratt & Whitney Gear Grinder, M.D.
11" Gleason Bevel Gear Generator
No. 64 Fellows Gear Shaper, M.D.
Cimatool Gear Chamfering, M.D.
Lees-Bradner Gear Grinder

LATHE — TURRET LATHES

6" x 6¾" Gass & DeLeeuw Chucking Machine
5" x 36" Jones & Lamson Turret Lathe, Steel Head
1⅝" Model G Gridley 4-Spdl. M.D.
2½" Cleveland Model A

SHAPERS — PLANERS

36" x 36" x 8' Woodward & Powell Planer, Rev. M.D.
30" x 48" x 12' Cin. Hypro Planer, 4 Hds.
18" x 18" x 4' Whitcomb Planer

MILLING MACHINES

4¼ x 12" Pratt & Whitney Thread Miller
#25B Defiance Hor. Bor. Mill—1941 Model
#2 Cincinnati Plain
#3 Wigglesworth Small Milling Machine—New

GRINDERS

10" x 120 Norton Grinder, M.D.
12" x 120" Landis Pl. M.D.
#10 Brown & Sharpe Pl. Grinder, M.D.
No. 3 Oesterlein Cutter & Tool Grinder

MISCELLANEOUS

21-SA Cochrane-Bly H.S. Saw
No. 171 Bliss Stiles Spru Cutter
New Delta Drilling Equipment

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Automatic, 2" Cleveland "A", built 1940
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Balancer, Micropoise flywheel
Balancer, 44" Norton
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Drill, 3½' American radial
Drill, No. 430 Barnes two way
Drill, 20" & 21" Cincinnati Bickford
Drill, 25" Weigel
Drill, Nos. 2 & 3 Henry Wright sens.
Drill, Nos. 11, 12 & 13 Natco multiple
Drill, Barnes 2 way, 12" x 48" capacity
Furnace, Lindberg pot type
Furnace, Surface Combustion drawing
Gear Hobber, 16HS Gould & Eberhardt
Gear Hobber, No. 1 Lees Bradner
Gear Lapper, 8" Red Ring
Gear Generator, 15" Gleason spiral bevel
Gear Tester & Lapper, 18" Gleason bevel
Gear Chamferer, Peerless & Lipe
Gear Cutters, 36" & 48" Brown & Sharpe
Grinder, 12" x 36", 16" x 36", 16" x 52" Landis
Grinder, 16" x 48" Landis crankpin
Grinder, No. 72 Heald auto. internal
Grinder, 20" Gardner semi-auto. disc.
Grinder, 8" x 24" Lasalle surface
Grinder, 12" x 24" Diamond surface
Grinder, 24" Cincinnati milling cutter
Honing Machine, No. 211 Barnes
Lapper, No. 10U Norton
Lathe, 18" x 8' Greaves Klusman QCG
Lathe, Turret, No. 3B Foster
Lathe, Turret, 26" Libby, 4½" or 7½" hole
Lathe, Turret, 36" Bullard vertical, Rap. Pro.
Mill, 42" Bullard vert., 1 plain, 1 turret head
Mill, 3" Universal horiz. boring
Miller, No. 2 Van Norman duplex
Miller, No. 2 Brown & Sharpe vert.
Miller, No. 3 Reed Prentice vertical
Miller 36" Newton cent. rotary
Miller, No. 1 Davis Thompson duplex
Miller, Type C Hall Planetary thread
Miller, Size 3 Turnmillers
Miller, Types 10 & 45 Productomatic
Miller, 48" Oesterlein tilted offset
Planer, 24" x 24" x 5' Gray
Planer, 36" x 36" x 16' Cleveland openside
Press, 600 ton Bliss coining
Press, No. 85½ A Bliss reducing
Press, 51", No. SG84 Ferracute dbl. cr.
Press, 34", No. 174 Consol. gap dbl. cr.
Press, 28", No. 71 Bwaino double crank
Press, No. 53 Toledo straight side
Press, No. 6 Waterbury Farrel openback
Press, No. 33 Consolidated arch frame
Press, No. 2 Standard screw type
Press, No. 796¼D Toledo toggle draw
Riveter, Nos. 2A, 5½B & 7B High Speed
Roll, No. R60 Yoder fender crowning
Roll, Forging, No. 1 Ajax Evans
Scraper, Anderson electric
Screw Driver, No. 61AA Bodine
Screw Driver, Model C Detroit
Sprue Cutter, Model 1 Tessmer
Swager, No. 6 HS Langelier
Saws, 4", 7" & 8" Higley cold
Saw, No. 0 Ryerson friction
Shear, 8" x 8" x 1" Long & Alstatter angle
Tester 22 lb. Tinius Olsen drop
Tester, 60,000 & 230,000 lb. Olsen torsion
Tapper, 1" Six spdl. National Nut
Tapper, Natco 1 & 2 way lead screw
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Welder, 80 KVA Taylor Winfield butt
Welder, 7 KVA Winfield automatic spot

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#14 Cochrane-Bly Vert. Miller & Shaper, M.D.
12" x 32" Landis Universal Grinder.
#2 Cleveland Universal Miller, M.D.
20"-24"-32" Shapers.
10' Bridgeport Knife Grinder.
36" Norton Draw Cut Shaper.
No. 3 Catlin Keysester 23" x 2", M.D.

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Niles 12' x 2' x 25' Double Housing Planer, Two Heads on Rail, Two Side Heads, Two-Section-Bed, Arranged Motor Drive — AVAILABLE IMMEDIATELY.

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Motor "V" Belt Drives. 3 HP, 220 V — 60c. 3 Ph — 900 RPM. Serial #314 M-3016 — Our No. 870. Serial #314 M-3026 — Our No. 871.

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1 Porter Cable Belt Sander and Polishing Machine. Model B-6, Serial #499. (No motor). "V" belt drive — 4" wide belt.

5 metal storage tanks. Round type — 100 gal. capacity with glass sight gages. Practically new.

1 Prybil Spinning Lathe. 20" swing, 60" bed. Belt drive. No jack shaft.

1 Prybil Spinning Lathe. 20" swing, 60" bed. Belt drive with mounted jack shaft. 2" standard thread spindle.

2 Brand New Fruin Spinning Lathes. Direct motor drive 3 HP, 4 speed, Bar control on 4 speeds. Howell "Red Bud" motor, 220 V, 60 c, 3 Ph. 2" spindle, 25" swing, 72" bed.

1 Seller's Gas-fired, fully Automatic Boiler. 100# press. 25 HP. Marine type H T electrical control, 220 V, 60 c, 3 Ph. Size 36" x 7'3".

2 "Fostoria" Coolant Filters. Model #12 with #D-1 stands.

1 Bryant Tubular Gas Boiler #13-S-443, Serial 312531. Steam rating 2860, hourly B.T.U. input 858.000. Water rating 4680, Max. W. P. steam 151 lbs. water 50 lbs. Manufacturer: The Bryant Heater Co.

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AVAILABLE

D-4 Colburn Drill, 3½" cap. No. 5 Taper, Arr. for M.D.	$ 900.
No. 33 Abrasive vertical spindle surface grinder	900.
8x20 Van Norman Surface Grinder, m.d., p.f.	600.
10" Pearson Arter Rotary Surface Grinder, S. P. D.	850.
No. 2 Oakley T. & C. Grinder, Power feed, M.D.	600.
24" Cinc. Automatic Mill, Rapid Traverse, S. P. D.	1100.
1½ LeBlond Mill, m.d., vertical head	1050.
No. 2 Bliss Dble. Crank Press, 45 Tons 32" x 23"	700.
24" Smith & Mills B.G. Shaper, M.D. with Motor	975.
No. 2 Van Norman Grinder 8"x14" M.D.	400.
56" Colburn vertical boring mill, 2 hds.	2250.
500—⅞" H. S. Drills, slightly used, in lots of 5, each	$1.00
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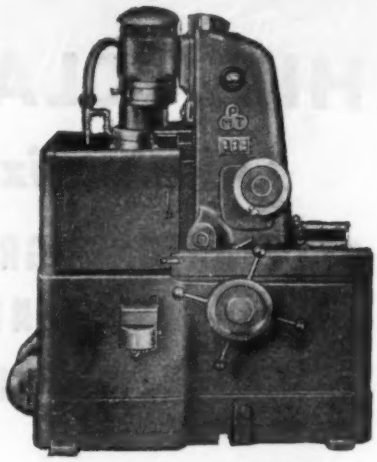

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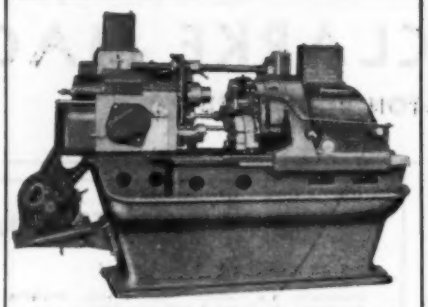
CHICAGO 7, ILLINOIS



8½" X 8" GOSS & DELEEUW CHUCKING MACHINE

Capacity 8½" in diameter x 8" long 5 chucks on turret

Maximum opening between chuck jaws 9⅝"

Minimum opening between chuck jaws 7⅝"

Maximum distance spindle nose to face of turret 23¾"

Dies and taps controlled by positive lead screw

Arranged for Motor Drive, without motor Weight approximately 12,000 lbs.

(Available for Prompt Delivery)

Emerman Machinery Corporation
875 W. 120th St., Chicago 43, Ill.

GRINDERS
Lees Bradner Gear Grinder.
Simplicity Piston Grinder.
12" x 96" Landis Plain, S.C.

GEAR MACHINERY
18" Gleason Bevel Gear Generators.
6" Bilgram Bevel Gear Generator.
#4—36" B & S Automatic Gear Cutter.
Lees Bradner Gear Grinder.
#6 Fellows Gear Shaper, Cone.
#3 Adams Farwell Gear Hobber.
#2 Pfauter Gear Hobber.
#18H Gould & Eberhardt Gear Hobber.

PLANERS
42" x 42" x 20' Cincinnati Hypro, 4 Heads, D.C. drive.
72" x 60" x 28' Pond 2 heads, Belt drive.
24" x 24" x 6' Gray Planer.
26" x 26" x 8' Woodward & Powell, 2 Hds.

RADIAL DRILLS
2½' American Plain, M.D.
3' American Sensitive.
3' Cincinnati Bickford Plain Radial Drill.
4 Spindle Sipp, Power Feeds.

LATHES
18" x 8' Lodge & Shipley, 3 S.C.D. D.B.G.
22" x 10' LeBlond 3 S.C.D. Q.C.
26" x 15' Pittsburgh, 3 S.C.D. Q.C.
20" x 8' Sebastian Geared Head, S.P.D.
36" x 18' Schumacher & Boye 5 S.C.D. Trip. Grd.

MISCELLANEOUS
14" Niles Slotter.
#4 Cincinnati Vert. High Power Mill, M.D.
#2B Brown & Sharpe Plain Miller, S.P.D.
#2 Cincinnati H.P. Universal Miller, S.P.D.

CINCINNATI MACHINERY & SUPPLY CO.
217 East Second St., Cincinnati, Ohio

FOR SALE
Coulter Diamond Boring Machine

Vertical, single spindle, complete with 5 HP, 440 volt, 3 phase drive with starter and work hold down—can finish bore holes up to 4" dia. by 3" deep. Machine ready to run.

THE OHIO ELECTRIC MFG. COMPANY
CLEVELAND, OHIO

MISCELLANEOUS MACHINES

48"x36"x16' Gray Dbl. Housing Planer, 3hds., 15 HP, A.C. m.d.
48"x48"x14' Gray Dbl. Housing Spur Grd. Planer with 4 hds., incl. 25 HP, A.C. motor.
12"x18" Cinci. Plunge Cut Grinder, A.C. m.d., 20x8" face wheel, rebuilt.
3¼" bar Morris Horiz. Boring Mill, m.d. with 4 bars.
6' Niles Pl. Radial Drill, A.C., m.d., Rebuilt.

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We have just finished printing an illustrated folder to show you why you can buy with confidence from The O'Brien Machinery Company. We've crammed it full of pictures that tell, better than words, that O'Brien is no "desk broker!" We show you our plant, our warehouse, our rebuilding shops, the assembly and testing departments. And there are many pictures of the types of machine tools and the power plant equipment that we rebuild, test and guarantee together with current lists of tools and equipment available.

A COPY OF THIS FOLDER WILL BE SENT YOU ON REQUEST.

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BORING MILL:—Bertram 42".
DRILLS:—Niles 7' Radial
Cincinnati-Bickford 5', 6' Radials
GRINDERS:—Landis 20"x168" Centers Plain
Norton 6x32, 10x24, 18x98
Baxter D. Whitney #23 Cylinder Grinder, Like New
Brown & Sharpe #10, 11 Plain
Brown & Sharpe #1, 3 Univ.
Bath 10"x25" Univ.
Cincinnati 12"x36" Univ.
Bryant #18 Hole; Bryant #3B, 6, 12 Internal
Brown & Sharpe #2 Surface
Blanchard #16—26" Chuck, M.D.
P & W 14" B.B. Vert. Surface
Farrel Roll Grinder
LATHES:—Lodge & Shipley 20"x8' Selective G.H.
Johnson 30"x24'
Wickes 32"x14' Cone, M.D.
Le Swing 4"x60", 3½"x108"
J & L 2¼x24, 3x36 Flat Turret
MILLERS:—Cin. #3, 4 Plain SPD
Owens #3 Universal
Milwaukee #1½B Vertical
Becker #4B Vertical
Cin. #4 Vertical SPD
B&S #3 Vertical SPD
Rowbottom Cam Miller
P&W 3" Automatic
Pratt & Whitney 12" Heavy Auto.
Pratt & Whitney 2" Saline Duplex
Pratt & Whitney 4½"x12", 6"x48" Thread Millers
Cincinnati 12" B.G. Mfg.
Becker #7H Lincoln
PLANERS:—Cincinnati 30"x30"x10'
Cincinnati 36"x36"x20'
Gray 36"x36"x10' 2 Head Planer; Gray 42x42x12
PRESSES:—Z & H #16 Percussion
Ferracute #DGGF56 Double Geared
105 Ton Cap. 36" stroke, Weight 38000 lbs. New 1939

BOTWINIK BROTHERS, INC.
373 Welton Street
New Haven, Conn.

MDNA MEMBER

UNUSUAL VALUES

Belt Cutter 1" capacity 3 spindle
Brake Robinson 5' toggle
Compressor, 120 Schramm, portable
Drill, near 10" Buffalo bench
Drill, ceiling suspended, unlimited drilling area
Drill Press, 20" three spindle Barnes
Drill, six-spindle Henry & Wright, 12" overhang
Drill, two spindle sensitive, #1 Morse taper
Grinder, #20 Bryant deep hole internal
Grinder, Sellers Tool
Grinder, 60" knife
Hammer, 50# Bradley upright, helve
Lathe, 24" x 12' Steptoe-McFarlan
Lathe, 18" x 10' Bradford, loose change
Pipe Machine, 8" Oster motor drive
Press, #8-7 Zah-Hahnemann straight side grd.
Press, #1 open back inclinable, motor drive
Punch & Shear, two ½" capacity
Threading Machine, #0 Webster & Perks
Turret Lathe, L & D brass, cross slide turret
Vacuum Cleaners, heavy duty for shop use

THE OSBORNE & SEXTON MACHINERY CO.
COLUMBUS, OHIO

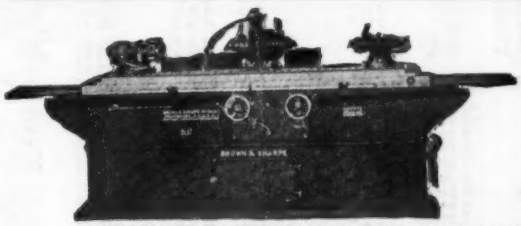
2—Libby 26" Turret Lathes with 12¼" hole in spindles with tooling.
1—No. 5 Cincinnati Plain Mill, S.P.D.
1—12" x 96" Landis Grinder, M.D.

MDNA MEMBER

D. E. DONY MACHINERY CO.
47 Laureiton Road, Rochester 9, N.Y.

SALE!

Of outstanding equipment that is hard to get. Priced below OPA permissable prices for immediate shipment.



No. 16 Brown & Sharpe 12x72 Plain Grinder
Equipped with center rests and back rests, oil pump and all standard tools and wrenches. Overhead drive.

MACHINE IN EXTREMELY FAVORABLE OPERATING CONDITION
CALL, WRITE OR WIRE FOR YOUR OPTION
$$$ SAVED ARE $$$ EARNED $$$

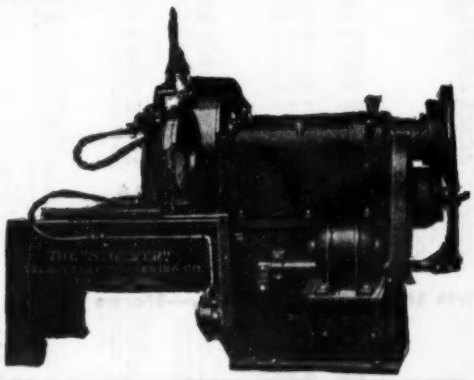
FRAZIER NO. 1 UNIVERSAL 8 x 24 overhead drive, equipped with full standard equipment.

NORTON NO. 1 UNIVERSAL TOOL CUTTER GRINDER with internal and external equipment.

REID NO. 2 SURFACE GRINDER with magnetic chuck, overhead drive.

4" STOEVER PIPE THREADER with complete set of dies, including oil pump.

Offering Machine Without Motor



AUTOMATICS

1¼" GRIDLEY MODEL F 4 spindle	PRICE	950.00
¾ GRIDLEY MODEL F 4 spindle	PRICE	750.00
1¼ NEW BRITAIN 4 spindle chucking, motor drive	PRICE	750.00

MARKS MACHINE TOOL CORP.
60 Franklin St. Worcester 8, Mass.

FOR IMMEDIATE DELIVERY— PRACTICALLY NEW AND REBUILT

BORING MILLS
24", 36", 42" and 54" Bullard and Cincinnati. Late type.

MILLING MACHINES
No. 1, No. 2, No. 3, No. 4, No. 5 Vertical and Horizontal. Cincinnati, Kearney & Trecker and Brown & Sharpe.

TURRET LATHES
No. 1A, No. 2A, No. 3A, No. 4 and No. 6. Warner & Swasey.

LATHES
14", 16", 18", 20", 24", 30", 36" up to 66". American, Leblond, Hendey, etc.

PLANERS
36"x36"x16' D&H M.D. Open Side.
20"x20"x6' Ames.
48"x48"x18' Putnam, M.D.
48"x48"x14' Cleveland M.D. Open Side. Box Table.

RADIAL DRILLS
5' and 6' Bickford.
5' Carlton, 17" column. Latest Model.
4' Carlton.

SHAPERS
14", 16", 18", 20", 24", 28" Gould & Eberhardt, Smith & Mills, etc.

GRINDERS
Internal and External. Many sizes.

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SAVE 20 - 30 - 40% OF NEW PRICE!

HIGH SPEED STEEL

Columbia Tool Steel Company—Molite

			Pounds	Inches
1¼"	Dia.	H.S.S.	529.07	783½"
1½"	Dia.	H.S.S.	995.89	1148"
2¼"	Dia.	H.S.S.	221.10	130"
5½"	Dia.	H.S.S.	211.06	32⅞"
6¼"	Dia.	H.S.S.	857.48	92¾"

Allegheny—Ludlum—D. B. L. Forging

3 x 3"	H.S.S.	90 pieces
4 x ¾"	H.S.S.	33 pieces
4 x 3"	H.S.S.	8 pieces
4¼ x 4"	H.S.S.	8 pieces
5¼ x 1"	H.S.S.	8 pieces
5 x 1½"	H.S.S.	8 pieces
6 x 1¼"	H.S.S.	39 pieces
6 x 1½"	H.S.S.	8 pieces
6 x 2"	H.S.S.	7 pieces

Crucible Steel Company—Rex MM

½"	Dia.	H.S.S.	24.87	402⅞"
¾"	Dia.	H.S.S.	116.11	1486⅞"
1"	Dia.	H.S.S.	174.55	1074½"
1"	Dia.	H.S.S.	22.38	137⅝"
1½"	Dia.	H.S.S.	140.72	649¾"
1"	Dia.	H.S.S.	32.61	132⅝"
1⅛"	Dia.	H.S.S.	201.49	724"
1⅛"	Dia.	H.S.S.	450.31	1059⅞"
1⅛"	Dia.	H.S.S.	554.02	1086⅞"
1⅛"	Dia.	H.S.S.	381.38	633"
1 11/16"	Dia.	H.S.S.	400.78	570½"
1¾"	Dia.	H.S.S.	128.71	158¾"
1½"	Dia.	H.S.S.	185.65	214"
1 15/16"	Dia.	H.S.S.	67.30	72½"
2⅛"	Dia.	H.S.S.	64.38	61⅞"
2⅛"	Dia.	H.S.S.	78.08	66½"
2⅛"	Dia.	H.S.S.	103.99	70½"
2⅛"	Dia.	H.S.S.	96.03	59½"
2¼"	Dia.	H.S.S.	36.60	20 10/16"
2¼"	Dia.	H.S.S.	33.12	17¾"
2¾"	Dia.	H.S.S.	177.85	91½"
3½"	Dia.	H.S.S.	39.15	15"
4½"	Dia.	H.S.S.	1,721.67	410"
6½"	Dia.	H.S.S.	252.85	37⅞"
8¼"	Dia.	H.S.S.	405.20	24½"

Crucible Steel Company—Rex AA

3½ x 1"	Dia.	H.S.S.		59½"
⅞ x 1¼"	Dia.	H.S.S.		222½"
¾ x 1¼"	Dia.	H.S.S.		27⅞"
¾ x ¾"	Dia.	H.S.S.		181⅝"
5½"	Dia.	H.S.S.	421.31	65"

Firth Sterling Steel Company—Starmo

¼"	Dia.	H.S.S.	4.52	525¼"
⅜"	Dia.	H.S.S.	11.78	764½"
½"	Dia.	H.S.S.	17.79	376½"
⅝"	Dia.	H.S.S.	3.28	53"
11/16"	Dia.	H.S.S.	1.22	19¼"
⅞"	Dia.	H.S.S.	46.00	589"
⅞"	Dia.	H.S.S.	9.71	100¾"
⅞"	Dia.	H.S.S.	35.37	254½"
1"	Dia.	H.S.S.	31.13	99½"
1 1/16"	Dia.	H.S.S.	3.76	12"
1⅛"	Dia.	H.S.S.	12.80	36⅜"
1 3/16"	Dia.	H.S.S.	5.46	15¾"
1¼"	Dia.	H.S.S.	31.68	93¼"
1¼"	Dia.	H.S.S.	51.48	79"
1⅜"	Dia.	H.S.S.	204.50	235⅛"
2"	Dia.	H.S.S.	34.68	35½"
2½"	Dia.	H.S.S.	30.64	27½"
2¾"	Dia.	H.S.S.	81.47	39 15/16"
2 11/16"	Dia.	H.S.S.	99.01	46½"
3⅛"	Dia.	H.S.S.	940.31	338"
3⅜"	Dia.	H.S.S.	147.98	50¾"
3⅜"	Dia.	H.S.S.	239.97	76¾"
3⅜"	Dia.	H.S.S.	121.23	36½"
3⅜"	Dia.	H.S.S.	180.44	52"
3⅜"	Dia.	H.S.S.	208.93	58½"
3½"	Dia.	H.S.S.	289.05	78"
3 15/16"	Dia.	H.S.S.	233.85	61½"
4"	Dia.	H.S.S.	329.10	83¾"
4⅛"	Dia.	H.S.S.	71.27	17½"
4⅛"	Dia.	H.S.S.	183.92	42½"
4⅛"	Dia.	H.S.S.	274.54	56½"
4⅛"	Dia.	H.S.S.	413.44	82⅜"
4⅛"	Dia.	H.S.S.	318.48	62"
4⅜"	Dia.	H.S.S.	198.94	36⅜"
4⅜"	Dia.	H.S.S.	307.96	55⅛"
4⅜"	Dia.	H.S.S.		52"
4 15/16"	Dia.	H.S.S.	386.52	64½"
5"	Dia.	H.S.S.	467.16	75⅛"
5⅛"	Dia.	H.S.S.	1,009.52	155⅛"
5⅛"	Dia.	H.S.S.	266.12	39½"
5⅛"	Dia.	H.S.S.	334.06	44½"
5⅛"	Dia.	H.S.S.	468.50	60"
5⅛"	Dia.	H.S.S.	522.19	64"
5⅛"	Dia.	H.S.S.	212.94	25"
6"	Dia.	H.S.S.	269.86	30½"
6⅛"	Dia.	H.S.S.	255.80	25½"
6⅛"	Dia.	H.S.S.	285.86	28½"
6⅛"	Dia.	H.S.S.	18.25	1⅝"
6⅜"	Dia.	H.S.S.	148.92	13⅜"
6⅜"	Dia.	H.S.S.	281.08	25"
6⅜"	Dia.	H.S.S.	349.93	30"
7⅛"	Dia.	H.S.S.	225.50	18"
7¼"	Dia.	H.S.S.	869.04	67"
7⅜"	Dia.	H.S.S.	322.14	24"
7⅜"	Dia.	H.S.S.	1,013.30	73"
7⅜"	Dia.	H.S.S.	1,059.75	71½"
8"	Dia.	H.S.S.	649.50	41½"
8¼"	Dia.	H.S.S.	428.29	25½"
¼ x ⅜"	Dia.	H.S.S.		692⅛"
¼ x ⅜"	Dia.	H.S.S.		627"
¼ x 1"	Dia.	H.S.S.		603⅛"
¾ x 1"	Dia.	H.S.S.	22.39	126½"
⅜" Sq.	Dia.	H.S.S.	229.72	1435¾"
⅜ x 1¼"	Dia.	H.S.S.	433.46	656¼"
1" Sq.		H.S.S.	242.04	849¼"
1¼ x 6"	Dia.	H.S.S.		194"

Blue Chip

1/16 x 11/16"	Dia.	H.S.S.	1740¾"
⅛ x ⅛"	Dia.	H.S.S.	5081½"
⅛ x ⅜"	Dia.	H.S.S.	483½"
⅛ x ½"	Dia.	H.S.S.	423¾"
⅛ x ⅝"	Dia.	H.S.S.	
⅛ x ¾"	Dia.	H.S.S.	128"
3/16 x ⅜"	Dia.	H.S.S.	208¾"
¼ x ⅜"	Dia.	H.S.S.	2943¾"
¼ x ½"	Dia.	H.S.S.	1599½"
¼ x ¾"	Dia.	H.S.S.	2030½"
5/16 x ¾"	Dia.	H.S.S.	1665¾"
⅜ x ⅜"	Dia.	H.S.S.	931"
⅜ x ½"	Dia.	H.S.S.	2537¼"
⅜ x ¾"	Dia.	H.S.S.	1990¼"

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AUTOMATICS, Acme, Model C—9/16" M.D.
AUTOMATICS, Gridley, 9/16" & ⅝" Model G
AUTOMATICS, Gridley, 2¾, 3¼ & 4¼" S.S.
AUTOMATICS, Cleveland, 1¼, 1½, 2¾ & 3¾"
AUTOMATICS, Cleveland, ⅞, 1¼ & 2½" Mod. B
AUTOMATICS, Cleveland ⅞, 1¼ & 1½" Mod. M
AUTOMATICS, Cone 1¼ & 1½" 4 spdles, M.D.
AUTOMATICS, New Britain #22 M.D.
AUTOMATICS, Potter & Johnston #5a & 6A
DRILLS, Baker Heavy Duty, #5 M.T.
GEAR HOBBERS, #5A Lees Bradner, M.D.
GEAR HOBBERS, #12 Barber-Colman, M.D.
GEAR SHAPERS, #7 High Speed, M.D. & #6
GRINDER, Blanchard #16A Rotary Surface, 30" x18" Magnetic Chuck
GRINDER, Brown & Sharpe #10 & 12 M.D.
GRINDERS, Landis, 6" x 18" Plain M.D.
MILLING MACHINES, Becker Vertical, Model S. D. 40" Rotary Table
MILLING MACHINES, Becker Vertical #5 & 6
MILLING MACHINES, Milwaukee #1A & 1½B Plain

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Pratt & Whitney 14" x 36" Vertical Spindle Ball Bearing Grinder, Model B, Serial #945, motor drive including motor and 11" x 34" magnetic chuck. Excellent condition.
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Tel. Main 6374-5

FOR SALE—AIRCRAFT STEELS

SAE 1019

Item No.		
100	¾" rd.	174 lbs.
101	1" Hex.	607 lbs.
102	2¼" rd.	1018 lbs.

SAE C-1019

103	¼" x ¼"	312 lbs.
104	11/16 dia.	104 lbs.
105	1½" dia.	285 lbs.

SAE 1020

106	¾" rd.	600 lbs.
107	¾" x 1¾"	120 lbs.
108	1" x 1½"	3418 lbs.
109	1 1/16" rd.	6672 lbs.
110	1 3/16" rd.	4937 lbs.
111	1¼" rd.	1994 lbs.
112	1½" rd.	1500 lbs.
113	2" rd.	2000 lbs.
114	2¼"	2924 lbs.
115	3½"	11400 lbs.
116	3¼" dia.	12350 lbs. (HR)

SAE X-1020

117	2½" dia.	9152 lbs.
118	3¼" dia.	4751 lbs.

SAE 1022

119	1¾"	479 lbs.

SAE 1025

120	1¾"	474 lbs.

SAE 1112

121	¾" sq.	388 lbs.
122	¾" rd.	600 lbs.
123	¾" rd.	4520 lbs.
124	1 3/16" dia.	1500 lbs.
125	2¾" dia.	5133 lbs.
126	3¼" dia.	2904 lbs.
126-A	2½" dia.	734 lbs.

SAE 1113

127	1½"	159 lbs.
128	2"	140 lbs.

SAE B-1113

129	1 5/16" dia.	5072 lbs.
130	1¾" dia.	1323 lbs.

SAE A-2315

131	¾" dia.	47 lbs

SAE 2330

A132	3/16" CDA	1900 lbs.
133	3/16 HRA	2000 lbs.
134	¼" CDN	2500 lbs.
135	¼" CDHT	154 lbs.
136	¼" CDA	2200 lbs.
137	5/16" Hex. CDN	6322 lbs.
138	5/16" CDN	5449 lbs.
A139	⅜" CDN	2000 lbs.
A140	⅜" CDA	3133 lbs.
141	7/16" CDA	6474 lbs.
142	7/16" Hex. CDA	28281 lbs.
143	7/16" Hex. CDN	11225 lbs.
144	½" Hex. CDN	10029 lbs.
145	½" Hex. CDA	4921 lbs.
146	9/16" Hex. CDA	22757 lbs.
147	9/16" Hex. CDN	45000 lbs.
148	9/16" dia. CDHT	704 lbs.
149	⅝" HRA	294 lbs.
150	⅝" dia. CDN	308 lbs.
151	11/16" CDA	5000 lbs.
152	11/16" CDHT	235 lbs.
153	¾" CDN	9850 lbs.
154	¾" rd. HRA	810 lbs.
155	¾" rd. CDHT	85 lbs.
A156	13/16" Hex HRA	1600 lbs.
A157	⅞" CDHT	9362 lbs.
158	⅞" Hex. CDA	17149 lbs.
159	⅞" Hex. CDN	3842 lbs.
A160	15/16" CDA	136 lbs.
A161	15/16" CDHT	8220 lbs.
A162	1" CD	2000 lbs.
163	1" CDHT	3000 lbs.
164	1" Hex. CDN	152 lbs.
165	1⅛" Hex. CDN	397 lbs.
A166	1 5/16" CDN	1343 lbs.
A167	1¼" CDHT	5500 lbs.
168	1¼" CDN Hex.	459 lbs.
169	1 7/16" dia. HRA	10449 lbs.
A170	1 7/16" CDHT	11880 lbs.
171	1½" rd. CDN	202 lbs.
A172	1 9/16" HRA	350 lbs.
173	2" Hex. CDN	1750 lbs.
173-A	1¾" rd. HRA	124 lbs.
174	4¼" sq. HRA	20000 lbs.

SAE 4130

Item No.		
175	1/16" Hex. CDA	1400 lbs.
176	3/16" dia. HRA	1000 lbs.
A177	⅛" x ¼" CDHT	110 lbs.
A178	⅛" CDN	237 lbs.
A179	¼" x 1" CDA	262 lbs.
180	¼" x 7/16" HRA	195 lbs.
181	¼" CDHT	637 lbs.
A182	5/16" x 4" HRA	15000 lbs.
183	5/16 HRA	4865 lbs.
184	5/16" CDN	8000 lbs.
185	⅜" x 1" HRA	893 lbs.
186	⅜" sq. CDA	1535 lbs.
187	⅜" HRA	250 lbs.
188	⅜" CDHT	40 lbs.
189	⅜" x 11/16" CDHT	94 lbs.
190	⅜" square HRA	100 lbs.
A191	9/16" x ⅝" HRA	1084 lbs.
192	9/16" CDHT	5283 lbs.
193	⅝" CDHT	13069 lbs.
194	⅝" CDN	23000 lbs.
195	⅝" CDA	651 lbs.
196	⅝" HRA	1848 lbs.
197	⅝" x ⅞" HRA	1627 lbs.
198	⅝" x 3¼" HRA	1034 lbs.
199	11/16" Hex. CDN	290 lbs.
A200	¾" x 1¾" HRA	4500 lbs.
201	¾" x 2" HRA	440 lbs.
202	¾" Hex. HRA	58 lbs.
203	¾" x 1½" HRA	10235 lbs.
A204	13/16" dia. CD 125,000 psi	12000 lbs.
205	13/16" rd. CDA	2572 lbs.
A206	⅞" x 1½" HRA	14674 lbs.
A207	⅞" x 1 5/16" HRA	1670 lbs.
A208	⅞" x 1 7/16" HRA	10506 lbs.
209	⅞" CDHT	5430 lbs.
210	⅞" rd. HRA	780 lbs.
A211	15/16" CHDT	196 lbs.
212	15/16" HRA	169 lbs.
213	15/16" CDN	3926 lbs.
A214	1" x 1¼" CDHT	322 lbs.
215	1" rd. HRA	20395 lbs.
216	1" x 1¼" HRA	154 lbs.
217	1" sq. HRA	53 lbs.
A218	1 1/16" HRA	1357 lbs.
219	1 1/16" CGN	4000 lbs.
220	1 1/16" x 1½" HRA	965 lbs.
A221	1⅛" x 1⅞" HRA	6239 lbs.
A222	1⅛" x 1 11/16" HRA	6280 lbs.
224	1⅛" x 1 5/16" HRA	805 lbs.
225	1⅛" x 3¼" HRA	69376 lbs.
227	1¼" CGN	5000 lbs.
228	1 3/16" CDN	9000 lbs.
229	1 3/16" CDHT	5039 lbs.
230	1¼" CGN	4000 lbs.
A231	1 5/16" dia. HRA	6480 lbs.
232	1 5/16" CDA Rd.	1139 lbs.
232-A	1¼" square HRA	5810 lbs.
A233	1⅜" HRA	1000 lbs.
234	1⅜" CDN	2911 lbs.
235	1⅜" CDA	159 lbs.
236	1⅜" CDHT rd.	589 lbs.
237	1⅜" rd. HRA	841 lbs.
A238	1 7/16" CDN	12100 lbs.
239	1 7/16" CDHT	3202 lbs.
240	1⅜" x 1¾" HRA	3744 lbs.
241	1 9/16" HRA	107 lbs.
242	1⅝" sq. HRA	210 lbs.
243	1⅝" CDN	2506 lbs.
244	2" CDA	1927 lbs.
245	2¼" rd. HRA	150 lbs.
246	2¼" CDHT	1167 lbs.
247	2¼" CDN	128 lbs.

SAE 4140

A248	2½" RCS HRA	21900 lbs.
A249	3¼" HRA	749 lbs.
A250	3½" sq. RCS HRA	1470 lbs.
A251	4" HRA	139002 lbs.
252	3/16" dia. HRA	4700 lbs.
253	¼" CDN	224 lbs.
254	¼" dia. CDN	5716 lbs.
255	¼" Hex. CDN	478 lbs.
256	¼" rd. HRA	375 lbs.
257	5/16" CDN	697 lbs.
258	5/16" CDHT	18 lbs.
259	⅜" dia. CDN	12700 lbs.
260	⅜" rd. CDHT	143 lbs.
261	9/16" rd. HRA	127 lbs.
262	⅝" x 2¾" HRA	17969 lbs.
A263	⅝" dia. CDN	6000 lbs.
264	⅝" x 4¾" HRA	79 lbs.
265	⅞" rd. HRA	116 lbs.
A266	13/16" dia. CD 125,000 psi	5000 lbs.
267	13/16" CDHT	3536 lbs.
A268	13/16" x 1¼" HRA	11565 lbs.
A269	15/16" dia. CDN	4000 lbs.
270	15/16" rd. HRA	119 lbs.
A271	1" x 1½" HRA	31111 lbs.
A272	1" x 1¾" HRA	3432 lbs.
273	1" dia. CDN	44000 lbs.
274	1" rd. HRA	2282 lbs.
275	1 1/16" rd. HRA	73 lbs.
A276	1⅛" x 2¼" HRA	6980 lbs.
277	1⅛" x 1 5/16" HRA	600 lbs.
278	1⅛" rd. HRA	168 lbs.
279	1 3/16" dia. CDHT	2097 lbs.
280	1 3/16" dia. HRA	5290 lbs.
A281	1 3/16" dia. CDN	15000 lbs.
282	1 3/16" CDN	2000 lbs.
283	1¼" x 3½" HRA	1376 lbs.
284	1¼" round CDHT	167 lbs.
285	1 5/16" CDN	8000 lbs.
A286	1 11/16" dia. HRA	115000 lbs.
A287	1 11/16" dia. CDA	121568 lbs.
288	1 11/16" rd. CDA	13763 lbs.
289	2" x 2¼" HRA	973 lbs.
A290	2¼" dia. HRA	38337 lbs.
A291	2¼" dia. CDA	7300 lbs.
A292	2¼" x 4" HRA	119 lbs.
293	2¼" x 3" HRA	900 lbs.
A294	2¼" x 7¼" HRA	146 lbs.
295	3" sq. HRA	11441 lbs.
296	3½" rd. HRA	325 lbs.
297	3½" x 5½" HRA	158 lbs.
298	4" rd. HRA	5477 lbs.
299	5" x 6" HRA	194 lbs.
A300	6" sq. HRA	5652 lbs.
A301	¾" x 1¾" CDA	7800 lbs.
A302	¾" x 1½" HRA	8625 lbs.
303	1 25/32" x 6 9/16" HRA	48375 lbs.

SAE X-4340

304	11/16" x 4" HRA	11064 lbs.
305	1" Hex. CDN	3139 lbs.
A306	1⅛" dia. HRA	415 lbs.
A307	1 7/16" Hex. CDN	12000 lbs.
308	1 7/16" Hex.	11331 lbs.
309	1 11/16" Hex. CDA	12975 lbs.
310	2¾" dia. CDN	1390 lbs.

NE-8739 BARS

311	1¾" dia. C.D.	29362 lbs.

NE-8740 BARS

312	2½" dia. C.D.	19880 lbs.
313	2¾" dia. C.D.	15137 lbs.

CHROME NICKEL BELGIAN STEEL (4% Nickel)

314	.3209 CN Bar	855 lbs.
315	.3209 CN Bar	465 lbs.
316	.4035 CN Bar	8650 lbs.
317	1.378 CN Bar	2334 lbs.
318	1.496 CN Bar	2247 lbs.
319	1.575 CN Bar	476 lbs.
320	2" dia. CN Bar	1127 lbs.
321	2 3/16" dia. CN Air Hard Bar	1637 lbs.
322	2¼" dia. CN Bar	553 lbs.
323	2½" dia. CN Bar	246 lbs.
324	4.72" dia. CN Bar	2814 lbs.
325	4.92" dia. CN Bar	1689 lbs.
326	5¾" dia. CN Bar	2244 lbs.
327	6" dia. CN Bar	2114 lbs.
328	6¼" dia. CN Bar	1607 lbs.
329	8" dia. CN Bar	2300 lbs.

STEEL BILLETS & BARS

330	5/16" dia. SAE 1040	500 lbs.
A331	7/16" dia. SAE 3245	1009 lbs.
332	9/16" dia. SAE 3140	239 lbs.
333	½" Hex. SAE 2320	958 lbs.
334	1" dia. Nickel Steel Spec. 468-23	341 lbs.
335	1 1/16" dia. SAE 1314	1813 lbs.
336	1¼" dia. C 1118	9069 lbs.
A337	1⅜" dia. SAE 1314	580 lbs.
338	1 7/16" dia. SAE 3115	1016 lbs.
339	1⅝" dia. SAE 3312	421 lbs.
340	⅜" dia. CNMV	166776 lbs.
341	Steel Ingots SAE 6135	489 lbs.
342	7/16" Hex. CMS Billet	5379 lbs.
343	½" dia. NS Bar	2845 lbs.
344	½" Hex. NS Bar	1013 lbs.
345	½" Hex. CMS Billets	9367 lbs.
346	1" Hex. CMS Billets	1567 lbs.
347	1 1/16" Hex. NS Bar	441 lbs.
348	1 1/16" Hex. CMS Billets	7996 lbs.
349	1⅛" dia. NS Bar	3314 lbs.
350	1 7/16" Hex. NS Bar	3914 lbs.
351	1½" Hex. CMS Billets	3271 lbs.

AIRCRAFT QUALITY STEEL SHEETS

A352	.025" x 12" x 72" x 4130 E.F.A.Q.	1 piece
A353	.072" x 18" x 72" x 4130 O.H.	231 piece
A354	.072" x 18" x 72" x 4130 E.F.	3167 piece
A355	.083" x 18" x 72" x 4130 O.H.	533 piece
A356	.083" x 18" x 72" x 4130 E.F.	400 piece

STAINLESS STEEL BAR (All Cold Drawn—Normaliged)

A357	¼" square Type S-302		50 lbs.
A358	¼" dia.	303	244 lbs.
A359	5/16 dia.	303	13 lbs.
AF360	5/16" Hex.	303	54 lbs.
A361	13/32" dia.	303	1380 lbs.
AF362	7/16" dia.	303	70 lbs.
A363	1" dia.	303	8000 lbs.
A365	1 1/16" dia.	303	1000 lbs.
AF366	1 3/16" dia.	304	196 lbs.
A367	1¼" dia.	303	1000 lbs.
A368	2¼" dia.	303	1323 lbs.
A370	⅝" square (18-8) Mill Lengths 16/20'		74884 lbs.

STAINLESS SHEETS

371	.010 36 x 96	680 pieces	6382 lbs
373	.018 36 x 96	65 pieces	1144 lbs

STAINLESS STEEL TUBING

A374	¼" x .049 Type	347	2073 ft. S
375	¼" x .093	347	2175 ft. S
376	¼" x .092	347	1410 ft. S
377	1" x .015"	347	2412 ft. W
378	2" x .037"	347	3375 ft. W
379	2¼" x .049	347	2585 ft. S
380	2¾" x .049	347	17934 ft. S

S—Seamless W—Welded

NE-8630 STEEL TUBING SEAMLESS (All Cold Drawn)

A382	7/16" x .095	1077 feet
A383	½" x .049	6615 feet
A384	½" x .095	2841 feet
A385	⅝" x .049	5337 feet
386	⅝" x .065	2100 feet

NE-8630 STEEL TUBING

A388	⅜" o.d. x .083	5606 feet
A389	1½" o.d. x .072	8988 feet
A390	1½" o.d. x .035	4848 feet
A391	1¾" o.d. x .156	6153 feet
392	⅜" x .083	1187 feet
393	1" x .095	509 feet
A394	1¼" x .058	2018 feet
A395	1½" x .065	4802 feet
A396	1½" x .250	1350 feet
A397	2¾" x .125	402 feet

SAE X-4130 CHROME MOLY STEEL TUBING

398	½" x .035	300 feet
A399	¾" x .028	1399 feet
A400	¾" x .095	760 feet
401	¾" x .028	2950 feet
A402	⅝" x .072	2300 feet
403	⅝" x .120	300 feet
A404	7/16" x .065	3859 feet
405	7/16" x .019	1186 feet
A406	½" x .072	2000 feet
A407	½" x .083	463 feet
408	⅜" sq. x .028	2554 feet
A409	⅜" x .095	51 feet
410	⅜" x .095	781 feet
A411	11/16" x .065	724 feet
A412	11/16" x .083	4280 feet
413	⅝" x .058	25510 feet
414	⅝" x .125	14 feet
A415	¾" sq. x .065	4143 feet
A416	¾" x .065	3291 feet
417	¾" x .083	423 feet
A418	¾" x .095	630 feet
A419	9/16" x .049	2407 feet
A420	1" x .028	163 feet
A421	1" x .158	1300 feet
A422	1" x .072	4692 feet
A423	1" sq. x .072	5734 feet
424	1 1/16" x .095	55 feet
425	1 1/16" x .313	1860 feet
A426	1⅛" x .072	3600 feet
A427	1⅛" x .095	7341 feet
A428	1⅛" x .035	1293 feet
429	1⅛" x .058	700 feet
A430	1⅛" sq. x .095	1503 feet
A431	1⅛" sq. x .095	5634 feet
A432	1⅛" x .108	29 feet
A433	1⅛" x .313	97 feet
A434	1 5/16" x .035	322 feet
A435	1⅛" x .035	518 feet
A436	1⅛" x .058	12750 feet
A437	1⅛" x .095	6276 feet
A438	1⅛" x .108	398 feet
A439	1⅛" x .120	2500 feet
A440	1⅛" x .344	22 feet
A441	1⅛" x .219	992 feet
A442	1⅛" x .812 x .035	2575 feet
443	1⅛" x .058	6648 feet
444	1⅛" x .109	135 feet
A445	1⅛" x .156	10820 feet
446	1 15/16" x .035	35 feet
447	2" x .035	1150 feet
448	2" x .125	826 feet
A449	2" x .250	492 feet
450	2" x .500	20 feet
451	2⅛" x .134	199 feet
452	2⅛" x .187	23 feet
A453	2⅛" x .188	900 feet
A454	2⅛" x .281	336 feet
455	2⅛" x .035	129 feet
456	2⅛" x .049	634 feet
457	2⅛" x .125	33 feet
458	2¼" x .219	410 feet
A459	3¼" x .500	2346 feet
A460	3½" x .049	205 feet
A461	3¾" x .500	98 feet

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Sheet Metal Dies . . . Jigs and Fixtures . . . Cold Forged Parts

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The Original Interchangeable Punch and Die

Perfected by Richard Brothers Division of Allied Products Corporation, this unit is now widely used in all metal working fields. Standard size square, round or end retainers are of case-hardened steel. The retainer is fitted with a patented ball bearing and spring lock which holds the punch or die securely but permits easy changing without removing the die from the press. Interchangeable punches are of water-hardened steel, rigidly tested and inspected. Carried in stock in a wide range of standard sizes. Special size retainer plates, punches and dies made to order. Write for the complete R-B catalog.

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"SERVICE WITH A PUNCH"

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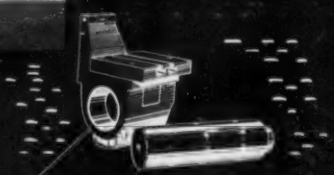
ENGINEERED FOR SPEED

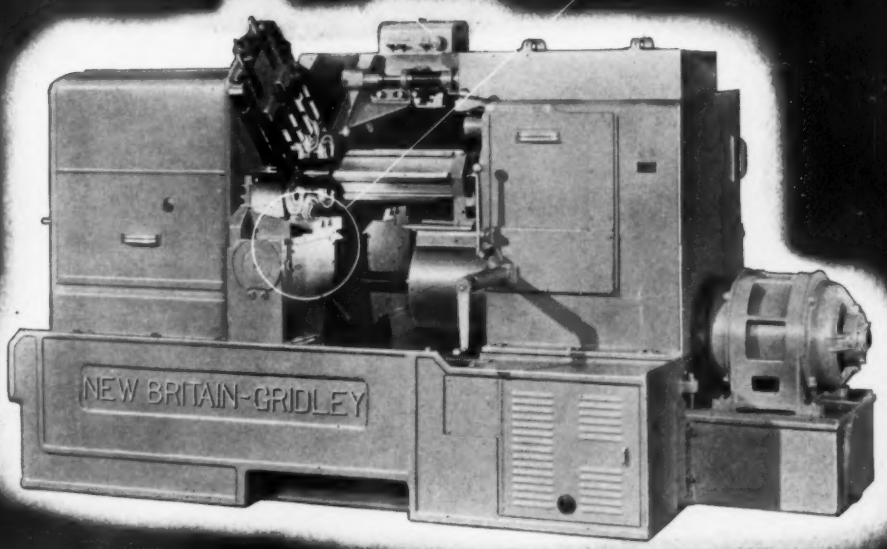
If you're looking for **speed**, remember New Britains can provide all and more than the most modern cutting tools can withstand. Nothing has been overlooked to reduce wasted production time . . . for instance, the three New Britain features described below:

• **AUTOMATIC STOP . . .** automatically stops machine with collet in loading position when stock is exhausted, and signals operator, thus saving important production time.

• **IDLE TIME REDUCED** to a minimum by accomplishing idle movements of machine such as drawback, index and jump at maximum speed.



• **FORMING SLIDES** of exclusive design permitting the fastest forming advances



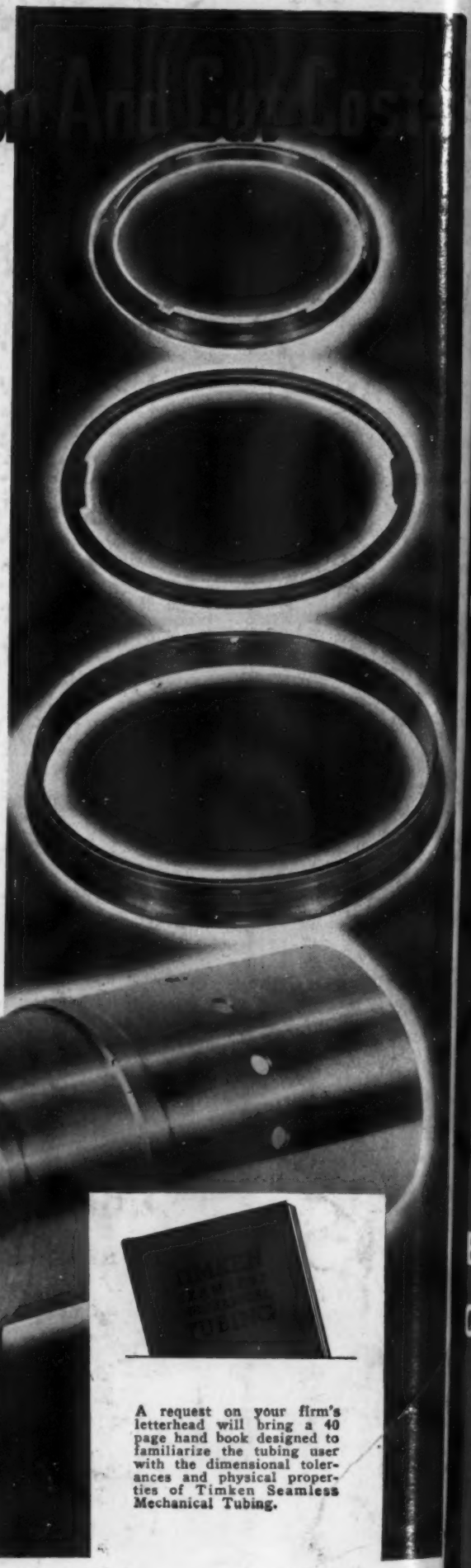
NEW BRITAIN AUTOMATICS

NEW BRITAIN-GRIDLEY MACHINE DIVISION — ARMY E NAVY — THE NEW BRITAIN MACHINE COMPANY

NEW BRITAIN, CONNECTICUT

To Increase Production And Cut Costs

MAKE PARTS LIKE THESE FROM TIMKEN SEAMLESS TUBING



As an example of the savings, in machine time and material, made possible by the use of seamless tubing, consider the cylindrical part in the illustration.

If bar stock is used for this job it must first be centered for drilling, then progressively larger drills must be used until the hole is big enough to permit the entrance of the boring bar.

Boring can begin immediately if seamless tubing is used. The need for expensive drills and time consuming drilling operations are eliminated.

In addition no stock is wasted in making the hole. Greater production can be secured on automatics because more finishing operations can be performed during each cycle of the machine.

Timken quality control that begins in the melt shop and is carried on through the final inspection, assures the high uniform quality of Timken Mechanical Seamless Tubing.

Our engineers will be glad to show you how Timken Mechanical Tubing can cut costs and increase the production and quality of your products. Steel and Tube Division, The Timken Roller Bearing Company, Canton 6, Ohio.

A request on your firm's letterhead will bring a 40 page hand book designed to familiarize the tubing user with the dimensional tolerances and physical properties of Timken Seamless Mechanical Tubing.